Product Specification

AU OPTRONICS CORPORATION

( ) Preliminary Specifications
(V) Final Specifications

Module	**WXGA Color TFT-LCD with LED Backlight design**
Model Name	**B121EW09 V3 (H/W:1A)**
Note ( )	***LED Backlight with driving circuit design***

Customer	**Date**	**Approved by**	**Date**
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Checked & Approved by	**Date**	**Prepared by**	**Date**
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Note: This Specification is subject to change without notice.

NBBU Marketing Division / AU Optronics corporation

Product Specification

AU OPTRONICS CORPORATION

Contents

Record of Revision

Version and Date	Page	Old description	New Description	Remark
0.1 2009/1/21				
0.2 2009/5/12	32		Update shipping label	
0.3 2009/6/09	6		Update min. brightness	
0.3 2009/6/09	7		Update Color Chromaticity	
0.3 2009/6/09	23		Update Power ON /OFF Sequence	
0.4 2009/7/22	16		Update duty ratio min. spec	
0.4 2009/7/22	23		Update Power ON /OFF Sequence	
0.5 2009/9/29	37		Delete IIS data	
1.0 2009/11/01	29		Update 2D graph	
1.0 2009/11/01	31		Update shipping label (add H/W & F/W)	
1.1 2009/12/24	29		Update 2D graph	
1.1 2009/12/24	31		Update shipping label	

1. Handling Precautions

1) Since front polarizer is easily damaged, pay attention not to scratch it.
2) Be sure to turn off power supply when inserting or disconnecting from input connector.
3) Wipe off water drop immediately. Long contact with water may cause discoloration or spots.
4) When the panel surface is soiled, wipe it with absorbent cotton or other soft cloth.
5) Since the panel is made of glass, it may break or crack if dropped or bumped on hard surface.
6) Since CMOS LSI is used in this module, take care of static electricity and insure human earth when handling.
7) Do not open nor modify the Module Assembly.
8) Do not press the reflector sheet at the back of the module to any directions.
9) At the insertion or removal of the Signal Interface Connector, be sure not to rotate nor tilt the Interface Connector of the TFT Module.
11) After installation of the TFT Module into an enclosure (Notebook PC Bezel, for example), do not twist nor bend the TFT Module even momentary. At designing the enclosure, it should be taken into consideration that no bending/twisting forces are applied to the TFT Module from outside. Otherwise the TFT Module may be damaged.
12) Small amount of materials having no flammability grade is used in the LCD module. The LCD module should be supplied by power complied with requirements of Limited Power Source (IEC60950 or UL1950), or be applied exemption.
13) Disconnecting power supply before handling LCD modules, it can prevent electric shock, DO NOT TOUCH the electrode parts, cables, connectors and LED circuit part of TFT module that a LED light bar build in as a light source of back light unit. It can prevent electrostic breakdown.

2. General Description

B121EW09 V3 is a Color Active Matrix Liquid Crystal Display composed of a TFT LCD panel, a driver circuit, and LED backlight system. The screen format is intended to support the WXGA (1280(H) x 800(V)) screen and 262k colors (RGB 6-bits data driver) with LED backlight driving circuit. All input signals are LVDS interface compatible.

B121EW09 V3 is designed for a display unit of notebook style personal computer and industrial machine.

2.1 General Specification

The following items are characteristics summary on the table at 25 ℃ condition:

Items	Unit	Specifications
Screen Diagonal	[mm]	307.9 (12.1W")
Active Area	[mm]	261.12(H) X 163.20(V)
Pixels H x V		1280x3(RGB) x 800
Pixel Pitch	[mm]	0.204X0.204
Pixel Arrangement		R.G.B. Vertical Stripe
Display Mode		Normally White
White Luminance (I_{LED}=20mA)	[cd/m^2]	220 typ. (5 points average) 187 min. (5 points average)
Luminance Uniformity		1.25 max. (5 points)
Contrast Ratio		300 typ
Response Time	[ms]	16 typ / 25 Max
Nominal Input Voltage VDD	[Volt]	+3.3 typ.
Power Consumption	[Watt]	3.87 max.(Include Logic and BLU power)
Weight	[Grams]	295 max.
Physical Size	[mm]	<table><tr><td></td><td>L</td><td>W</td><td>T</td></tr><tr><td>Max</td><td>276.3</td><td>178.6</td><td>5.3</td></tr><tr><td>Typical</td><td>275.8</td><td>178.1</td><td>-</td></tr><tr><td>Min</td><td>275.3</td><td>-</td><td>-</td></tr></table>
Electrical Interface		1 channel LVDS

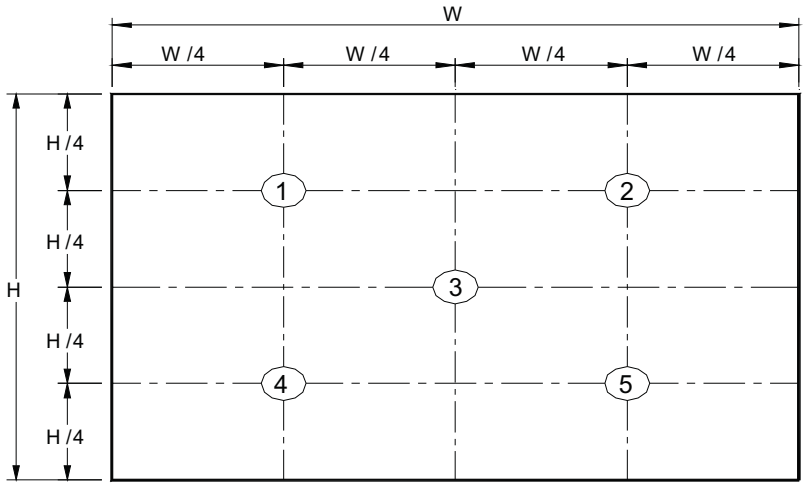
Surface Treatment		Anti-glare (Haze=42%(typ.)) -Anti-reflection -Anti-electrostatic -Hardness (2H)
Support Color		262K colors (RGB 6-bit)
Temperature Range Operating Storage (Non-Operating)	 [°C] [°C]	 0 to +50 -20 to +60
RoHS Compliance		RoHS Compliance

2.2 Optical Characteristics

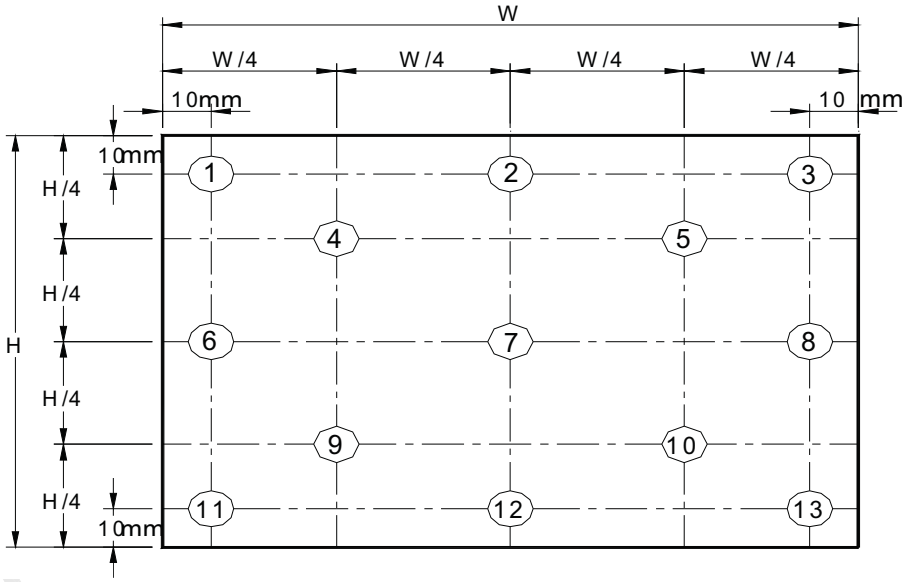
The optical characteristics are measured under stable conditions at 25℃ (Room Temperature) :

Item		Symbol	Conditions	Min.	Typ.	Max.	Unit	Note
White Luminance I_{LED}=20mA			5 points average	187	220	-	cd/m^2	1, 4, 5.
Viewing Angle		θ_R	Horizontal (Right) CR = 10	40	45	-	degree	4, 9
		θ_L	Horizontal (Left) CR = 10	40	45	-		
		ϕ_H	Vertical (Upper) CR = 10	10	20	-		
		ϕ_L	Vertical (Lower) CR = 10	30	40	-		
Luminance Uniformity		δ_{5P}	5 Points	-	-	1.25		1, 3, 4
Luminance Uniformity		δ_{13P}	13 Points	-	-	1.54		2, 3, 4
Contrast Ratio		CR			300	-		4, 6
Cross talk		%				4		4, 7
Response Time		T_r	Rising	-	_	-	msec	4, 8
		T_f	Falling	-	_	-		
		T_{RT}	Rising + Falling	-	16	25		
Color / Chromaticity Coodinates	Red	Rx	CIE 1931	0.530	0.560	0.590		4
		Ry		0.320	0.350	0.380		
	Green	Gx		0.315	0.345	0.375		
		Gy		0.530	0.560	0.590		
	Blue	Bx		0.120	0.150	0.180		
		By		0.075	0.105	0.135		
	White	Wx		0.283	0.313	0.343		
		Wy		0.299	0.329	0.359		
NTSC		%		-	45	-		

Note 1: 5 points position (Ref: Active area)



Note 2: 13 points position (Ref: Active area)



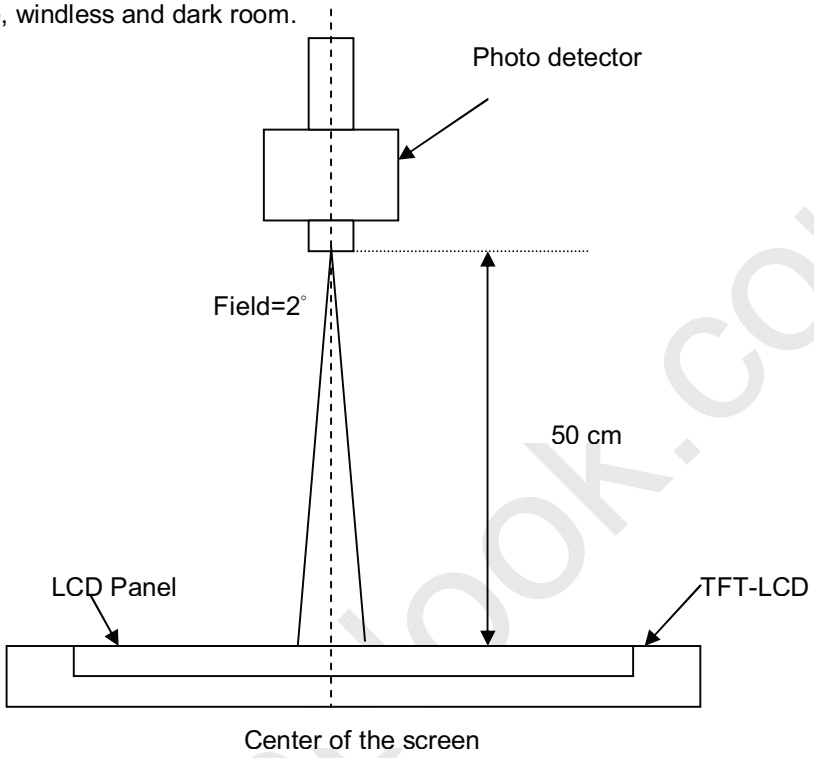
Note 3: The luminance uniformity of 5 or13 points is defined by dividing the maximum luminance values by the minimum test point luminance. Length unit

$$\delta_{W5} = \frac{\text{Maximum Brightness of five points}}{\text{Minimum Brightness of five points}}$$

$$\delta_{W13} = \frac{\text{Maximum Brightness of thirteen points}}{\text{Minimum Brightness of thirteen points}}$$

Note 4: Measurement method

The LCD module should be stabilized at given temperature for 30 minutes to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting Backlight for 30 minutes in a stable, windless and dark room.



Note 5： Definition of Average Luminance of White (Y_L):

Measure the luminance of gray level 63 at 5 points，Y_L = [L (1)+ L (2)+ L (3)+ L (4)+ L (5)] / 5

L (x) is corresponding to the luminance of the point X at Figure in Note (1).

Note 6： Definition of contrast ratio:

Contrast ratio is calculated with the following formula.

$$\text{Contrast ratio (CR)} = \frac{\text{Brightness on the “White” state}}{\text{Brightness on the “Black” state}}$$

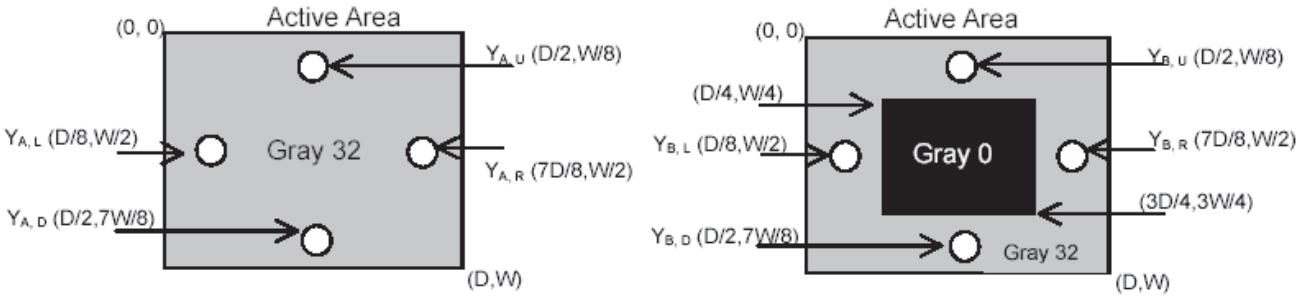
Note 7： Definition of Cross Talk (CT)

$CT = | Y_B – Y_A | / Y_A \times 100\ (\%)$

Where

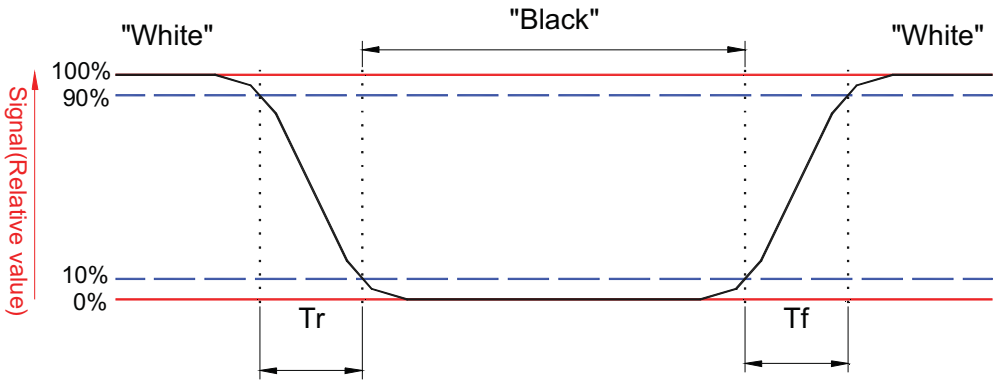
Y_A = Luminance of measured location without gray level 0 pattern (cd/m^2)

Y_B = Luminance of measured location with gray level 0 pattern (cd/m2)



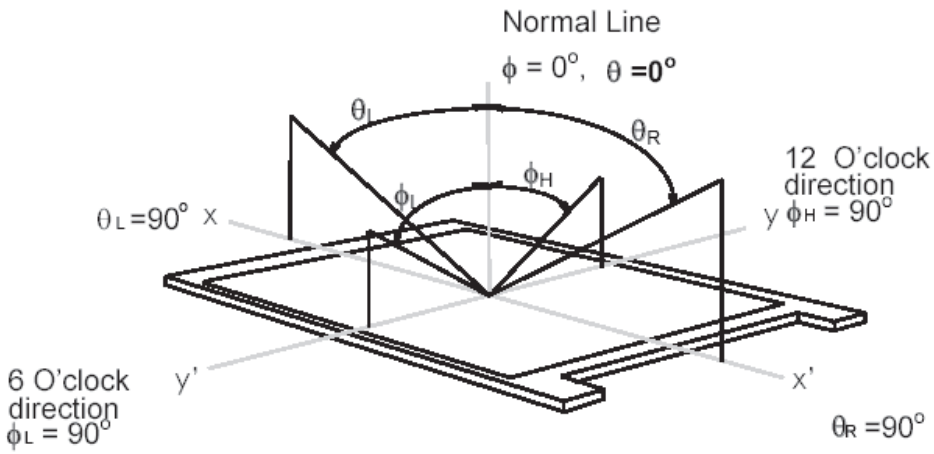
Note 8: Definition of response time:

The output signals of BM-7 or equivalent are measured when the input signals are changed from “Black” to “White” (falling time) and from “White” to “Black” (rising time), respectively. The response time interval between the 10% and 90% of amplitudes. Refer to figure as below.



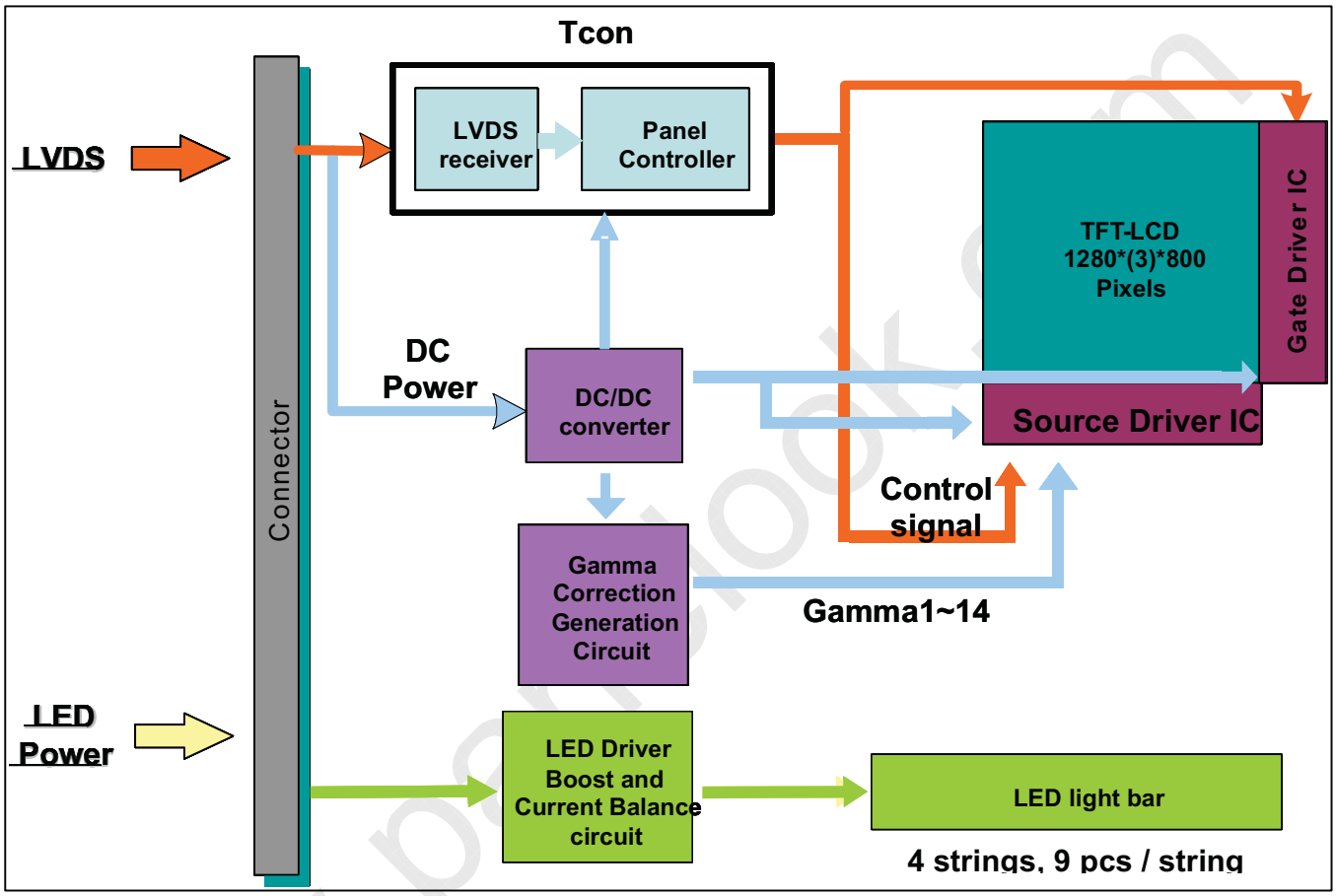
Note 8. Definition of viewing angle

Viewing angle is the measurement of contrast ratio ≧10, at the screen center, over a 180° horizontal an d 180° vertical range (off-normal viewing angles). The 180° viewing angle range is broken down as follows; 90 °(θ) horizontal left and right and 90°(Φ) vertical, high (up) and low (down). The measurement direction is typically perpendicular to the display surface with the screen rotated about its center to develop the desired measurement viewing angle.



3. Functional Block Diagram

The following diagram shows the functional block of the 12.1 inches wide Color TFT/LCD 30 Pin (One ch/connector Module)



4. Absolute Maximum Ratings

An absolute maximum rating of the module is as following:

4.1 Absolute Ratings of TFT LCD Module

Item	Symbol	Min	Max	Unit	Conditions
Logic/LCD Drive	Vin	-0.3	+4.0	[Volt]	Note 1,2

4.2 Absolute Ratings of Backlight Unit

Item	Symbol	Min	Max	Unit	Conditions
LED Driving Voltage	V_{LED}	-	36	[Volt]	Note 1,2,3
LED Driving Current	I_{LED}	-	30	[mA] rms	Note 1,2,3

4.3 Absolute Ratings of Environment

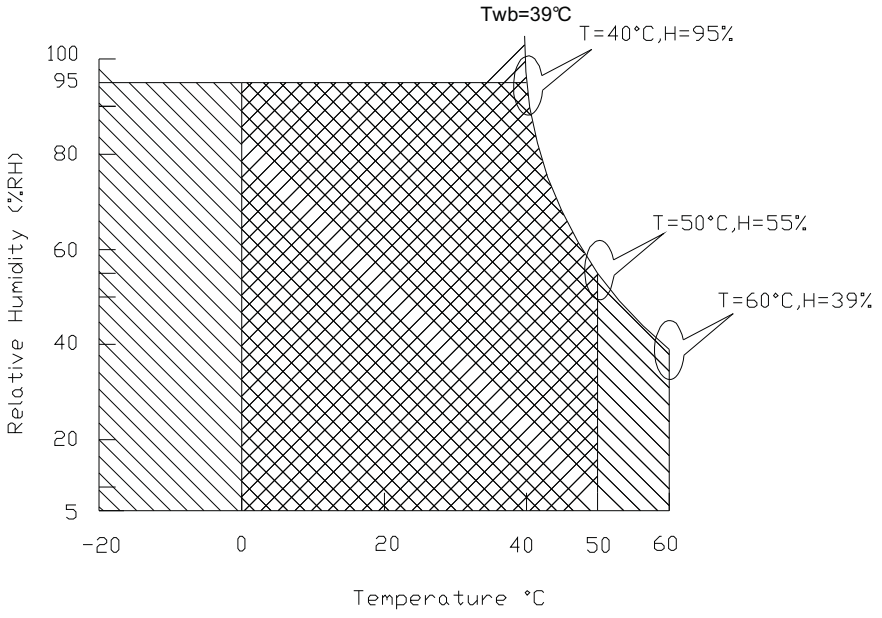
Item	Symbol	Min	Max	Unit	Conditions
Operating Temperature	TOP	0	+50	[°C]	Note 4
Operation Humidity	HOP	5	90	[%RH]	Note 4
Storage Temperature	TST	-20	+60	[°C]	Note 4
Storage Humidity	HST	5	90	[%RH]	Note 4

Note 1: At Ta (25℃)

Note 2: Permanent damage to the device may occur if exceed maximum values

Note 3: LED specification refer to section 5.2

Note 4: For quality performance, please refer to AUO IIS (Incoming Inspection Standard).



Operating Range Storage Range +

5. Electrical characteristics

5.1 TFT LCD Module

5.1.1 Power Specification

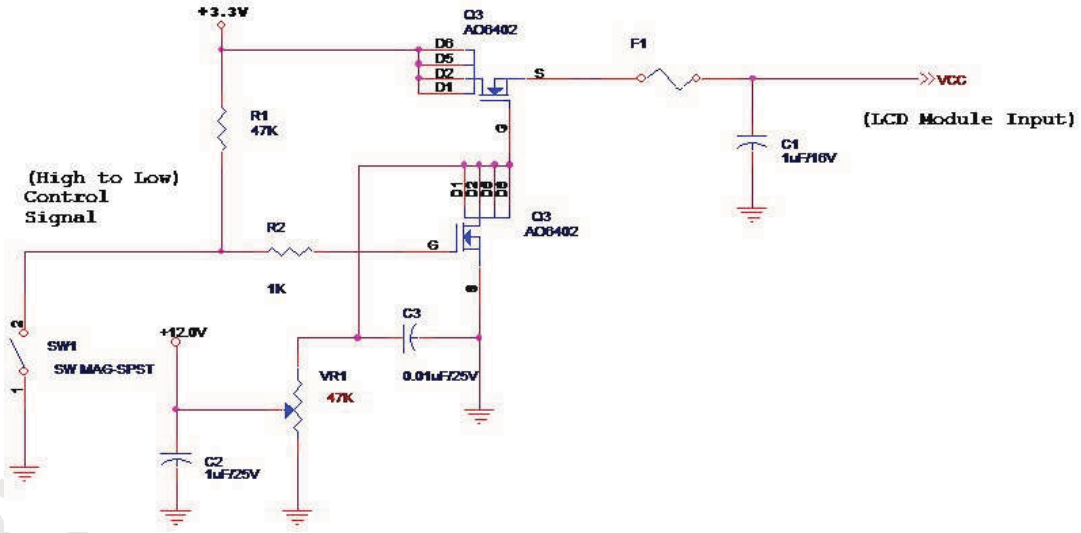
Input power specifications are as follows;

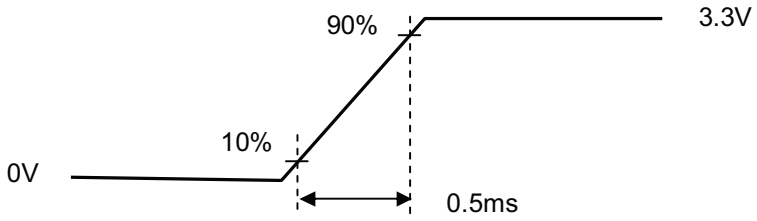
Symble	Parameter	Min	Typ	Max	Units	Note
VDD	Logic/LCD Drive Voltage	3.0	3.3	3.6	[Volt]	
PDD	VDD Power	-	0.78	0.9	[Watt]	Note 1/2
IDD	IDD Current	-	235	-	[mA]	Note 1/2
IRush	Inrush Current	-	-	2000	[mA]	Note 3
VDDrp	Allowable Logic/LCD Drive Ripple Voltage	-	-	100	[mV] p-p	

Note 1 : Maximum Measurement Condition：Black Pattern

Note 2：Typical Measurement Condition: Mosaic Pattern

Note 3：Measure Condition





Vin rising time

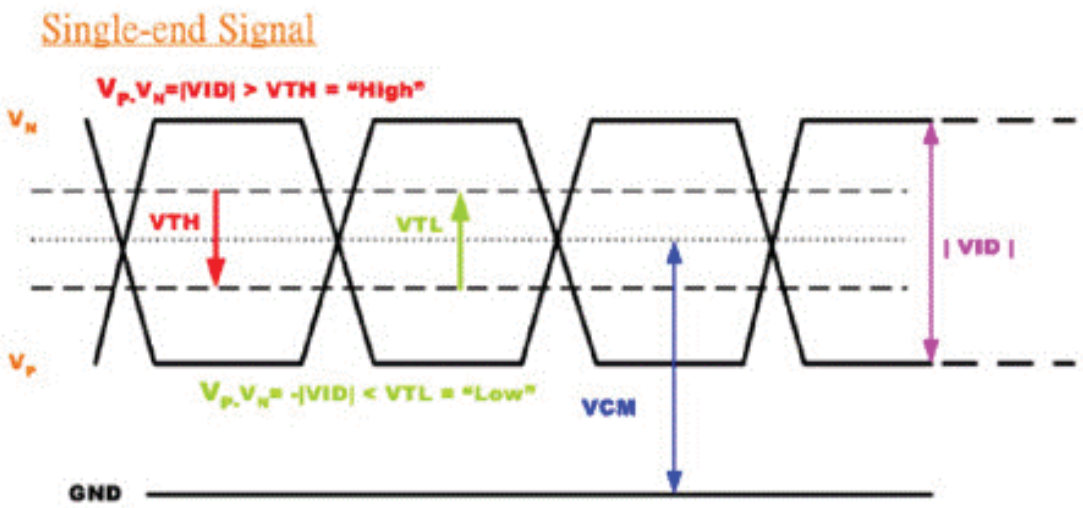
5.1.2 Signal Electrical Characteristics

Input signals shall be low or High-impedance state when VDD is off.

Signal electrical characteristics are as follows;

Parameter	Condition	Min	Max	Unit
V_{TH}	Differential Input High Threshold (Vcm=+1.2V)		100	[mV]
V_{TL}	Differential Input Low Threshold (Vcm=+1.2V)	-100	-	[mV]
$\|V_{ID}\|$	Differential Input Voltage	100	600	[mV]
V_{CM}	Differential Input Common Mode Voltage	1.125	1.375	[V]

Note: LVDS Signal Waveform



5.2 Backlight Unit

LED Parameter guideline for LED driving selection (Ref. Remark 1)

Parameter	Symbol	Min	Typ	Max	Units	Condition
LED Forward Voltage	V_F	3.0	3.2	3.4	[Volt]	(Ta=25℃)
LED Forward Current	I_F		20		[mA]	(Ta=25℃)
LED Power consumption	P_{LED}		2.71	2.97	[Watt]	(Ta=25℃) Note 1
LED Life-Time	N/A	12,000	-	-	Hour	(Ta=25℃) I_F=20 mA Note 2
Output PWM frequency	FPWM	100	200	20K	Hz	
Duty ratio	--	1	--	100	%	Note 3

Note 1: Calculator value for reference $I_F \times V_F \times$ 36/ efficiency (85%) = P (typ.); P (max) estimated with I_F and V_F tolerance.

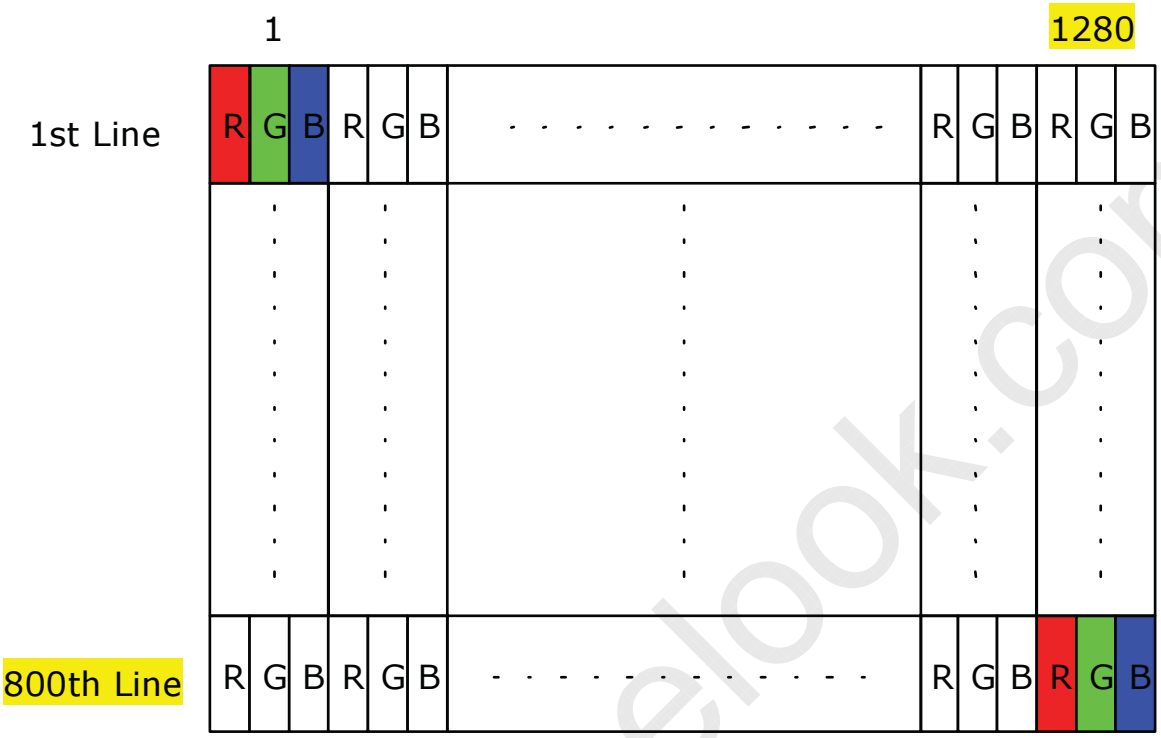
Note 2: The LED life-time define as the estimated time to 50% degradation of initial luminous.

Note 3: Output PWM frequency< 5K Hz.

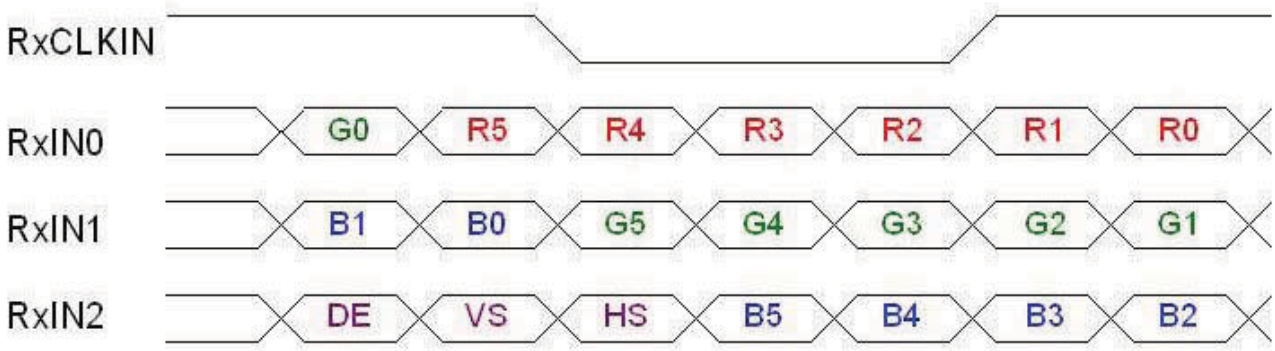
6. Signal Characteristic

6.1 Pixel Format Image

Following figure shows the relationship of the input signals and LCD pixel format.



6.2 The input data format



Signal Name	Description	
R5 R4 R3 R2 R1 R0	Red Data 5 (MSB) Red Data 4 Red Data 3 Red Data 2 Red Data 1 Red Data 0 (LSB) Red-pixel Data	Red-pixel Data Each red pixel's brightness data consists of these 6 bits pixel data.
G5 G4 G3 G2 G1 G0	Green Data 5 (MSB) Green Data 4 Green Data 3 Green Data 2 Green Data 1 Green Data 0 (LSB) Green-pixel Data	Green-pixel Data Each green pixel's brightness data consists of these 6 bits pixel data.
B5 B4 B3 B2 B1 B0	Blue Data 5 (MSB) Blue Data 4 Blue Data 3 Blue Data 2 Blue Data 1 Blue Data 0 (LSB) Blue-pixel Data	Blue-pixel Data Each blue pixel's brightness data consists of these 6 bits pixel data.
RxCLKIN	Data Clock	The typical frequency is 69.3 MHZ. The signal is used to strobe the pixel data and DE signals. All pixel data shall be valid at the falling edge when the DE signal is high.
DE	Display Timing	This signal is strobed at the falling edge of RxCLKIN. When the signal is high, the pixel data shall be valid to be displayed.
VS	Vertical Sync	The signal is synchronized to RxCLKIN .
HS	Horizontal Sync	The signal is synchronized to RxCLKIN .

Note: Output signals from any system shall be low or High-impedance state when VDD is off.

6.3 Signal Description/Pin Assignment

LVDS is a differential signal technology for LCD interface and high speed data transfer device.

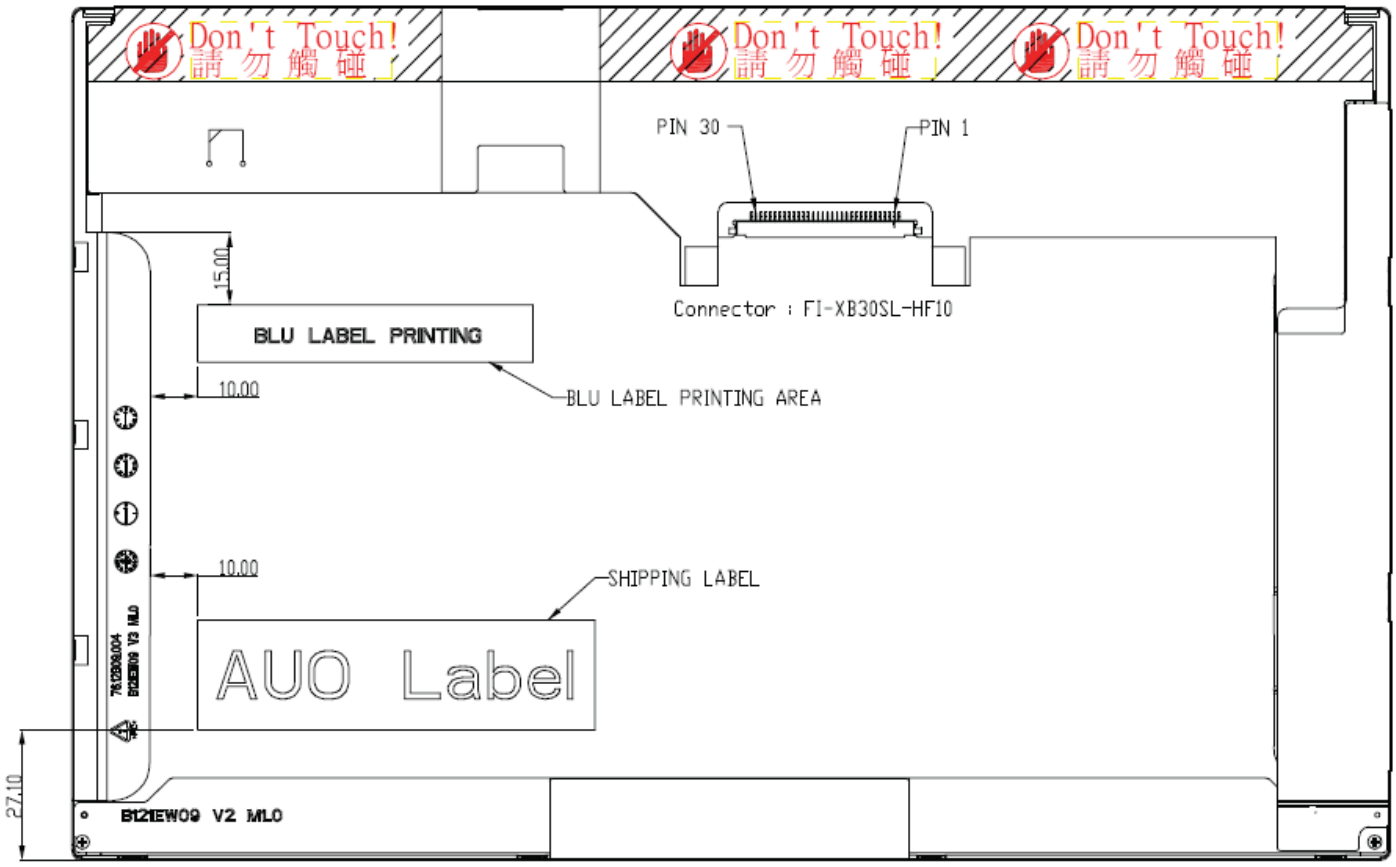
Connector PN: FI-XB30SL-HF10

Pin#	Signal Name
1	NC
2	VDD
3	VDD
4	V_{EDID}
5	Reserved (for supplier test point)
6	Ckl_{EDID}
7	$Data_{EDID}$
8	Odd RxIN0- (R0-R5,G0)
9	Odd RxIN0+ (R0-R5,G0)
10	GND
11	Odd RxIN1- (G1-G5, B0-B1)
12	Odd RxIN1+ (G1-G5, B0-B1)
13	GND
14	Odd RxIN2- (B2-B5,HS,VS,DE)
15	Odd RxIN2+ (B2-B5,HS,VS,DE)

Pin#	Signal Name
16	GND
17	Odd RxCLKIN- (Clock Input)
18	Odd RxCLKIN+ (Clock Input)
19	GND
20	GND
21	VBL- **(GND)**
22	VBL- **(GND)**
23	VBL- **(GND)**
24	NC
25	VBL+ **(7~21V)**
26	VBL+ **(7~21V)**
27	VBL+ **(7~21V)**
28	PWM
29	BL_ON
30	NC

NC: Not connected

Note1: Signal Start from right side



6.4 Interface Timing

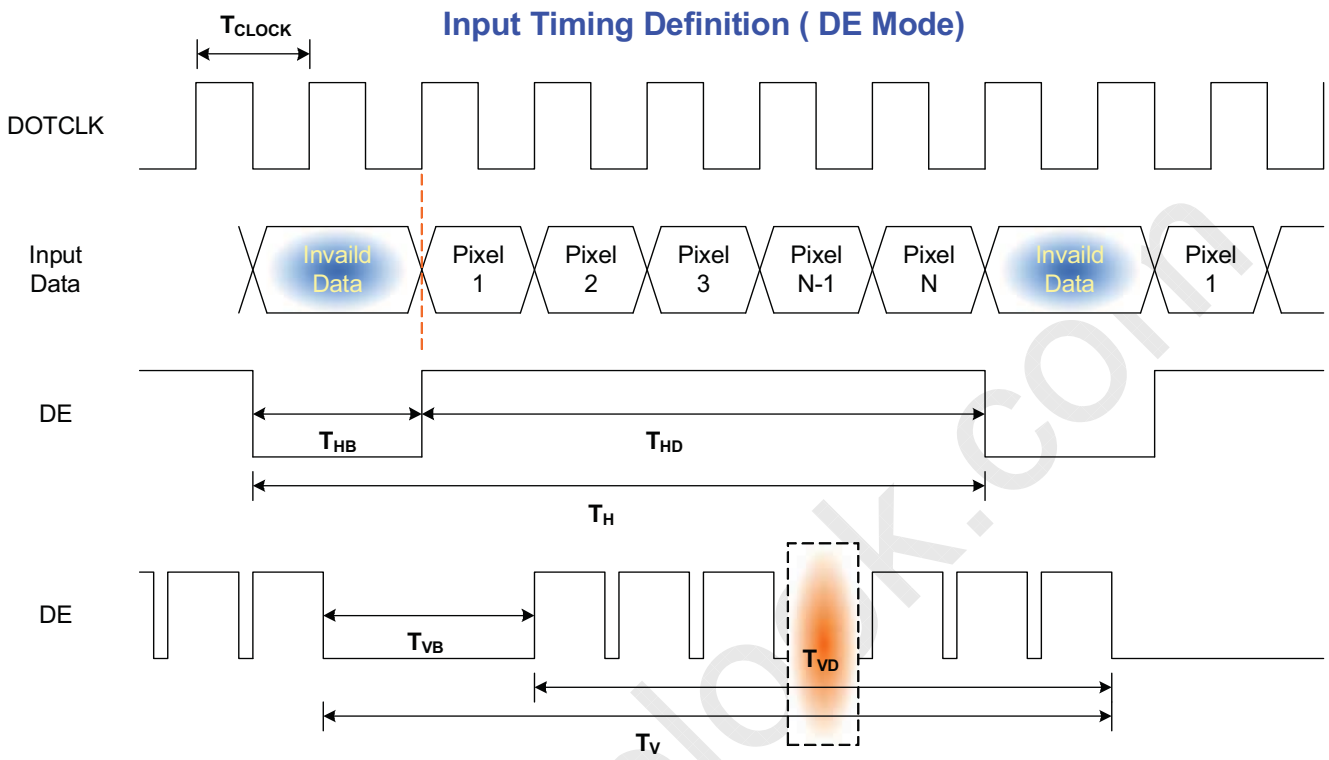
6.4.1 Timing Characteristics

Basically, interface timings should match the 1280x800 /60Hz manufacturing guide line timing.

Parameter		Symbol	Min.	Typ.	Max.	Unit
Frame Rate		-	-	60	-	Hz
Clock frequency		$1/T_{Clock}$	50-	69.3	80-	MHz
Vertical Section	Period	T_V	808	816	1023	T_{Line}
	Active	T_{VD}	800	800	800	
	Blanking	T_{VB}	8	16	223	
Horizontal Section	Period	T_H	1310	1408	2047	T_{Clock}
	Active	T_{HD}	1280	1280	1280	
	Blanking	T_{HB}	30	128	767	

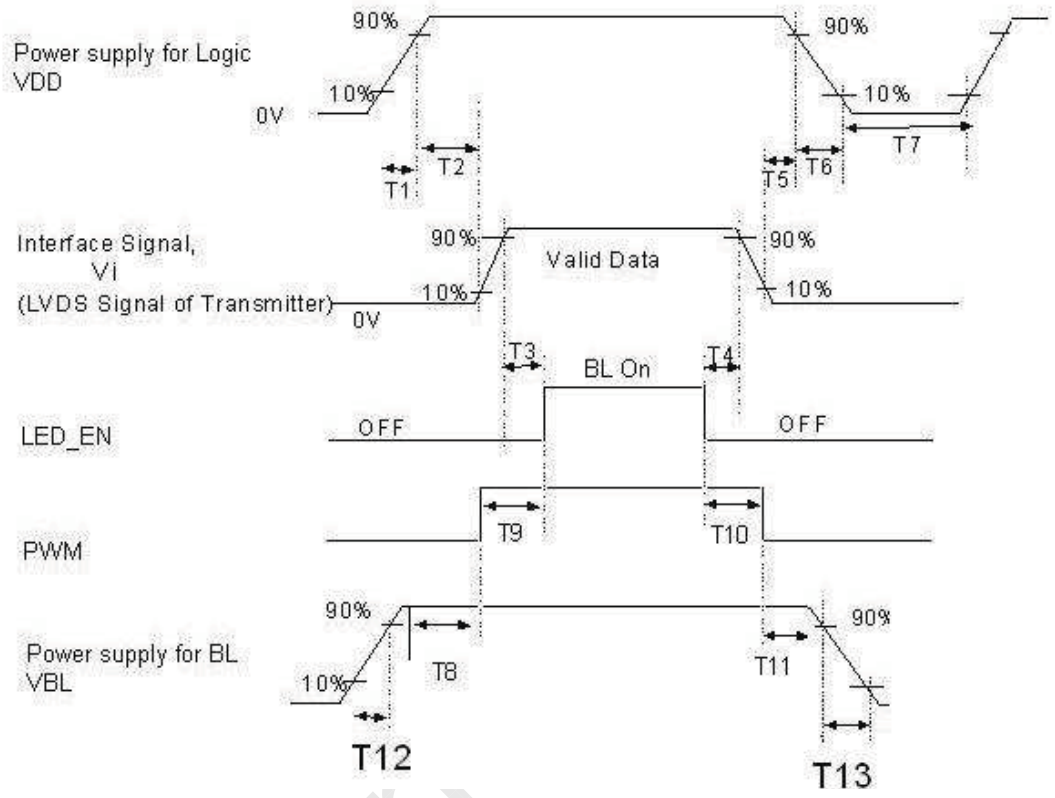
Note : DE mode only

6.4.2 Timing diagram



6.5 Power ON /OFF Sequence

Power on/off sequence is as follows. Interface signals and LED on/off sequence are also shown in the chart. Signals from any system shall be Hi-Z state or low level when VDD is off



Power Sequence Timing				
Parameter	Value			Units
	Min.	Typ.	Max.	
T1	0.5	-	10	ms
T2	0	-	50	
T3	200	-	-	
T4	0	-	-	
T5	0	-	-	
T6	0	-	10	
T7	150	-	-	
T8	0	-	-	
T9	0	-	-	
T10	0	-	-	
T11	0	-	-	
T12	0.5	-	-	
T13	0	-	-	

Note: If T4<200ms, the display garbage may occur. We suggest T4>200ms to avoid the display garbage.

Note:If T1 or T12 < 0.5, the inrrush curren may cause the damage of fuse. If the T1 or T12<0.5, the inrush current I^2t is under typical melt of fuse Spec., there's no above-mentioned problem.

7. Connector Description

Physical interface is described as for the connector on module.

These connectors are capable of accommodating the following signals and will be following components.

7.1 TFT LCD Module

Connector Name / Designation	For Signal Connector
Manufacturer	Japan Aviation Electronics Industry, LTD
Type / Part Number	FI-XB30SL-HF10
Mating Housing/Part Number	FI-XB30SRL-HF11

8. 8. LED Driving Specification

8.1 Connector Description

It is a intergrative interface and comibe into LVDS connector. The type and mating refer to section 7.

8.2 Pin Assignment

Ref. to 6.3

9. Vibration and Shock Test

9.1 Vibration Test

Test Spec:

- Test method: Non-Operation
- Acceleration: 1.5 G
- Frequency: 10 - 500Hz Random
- Sweep: 30 Minutes each Axis (X, Y, Z)

9.2 Shock Test Spec:

Test Spec:

- Test method: Non-Operation
- Acceleration: 220 G , Half sine wave
- Active time: 2 ms
- Pulse: X,Y,Z .one time for each side

10. Reliability

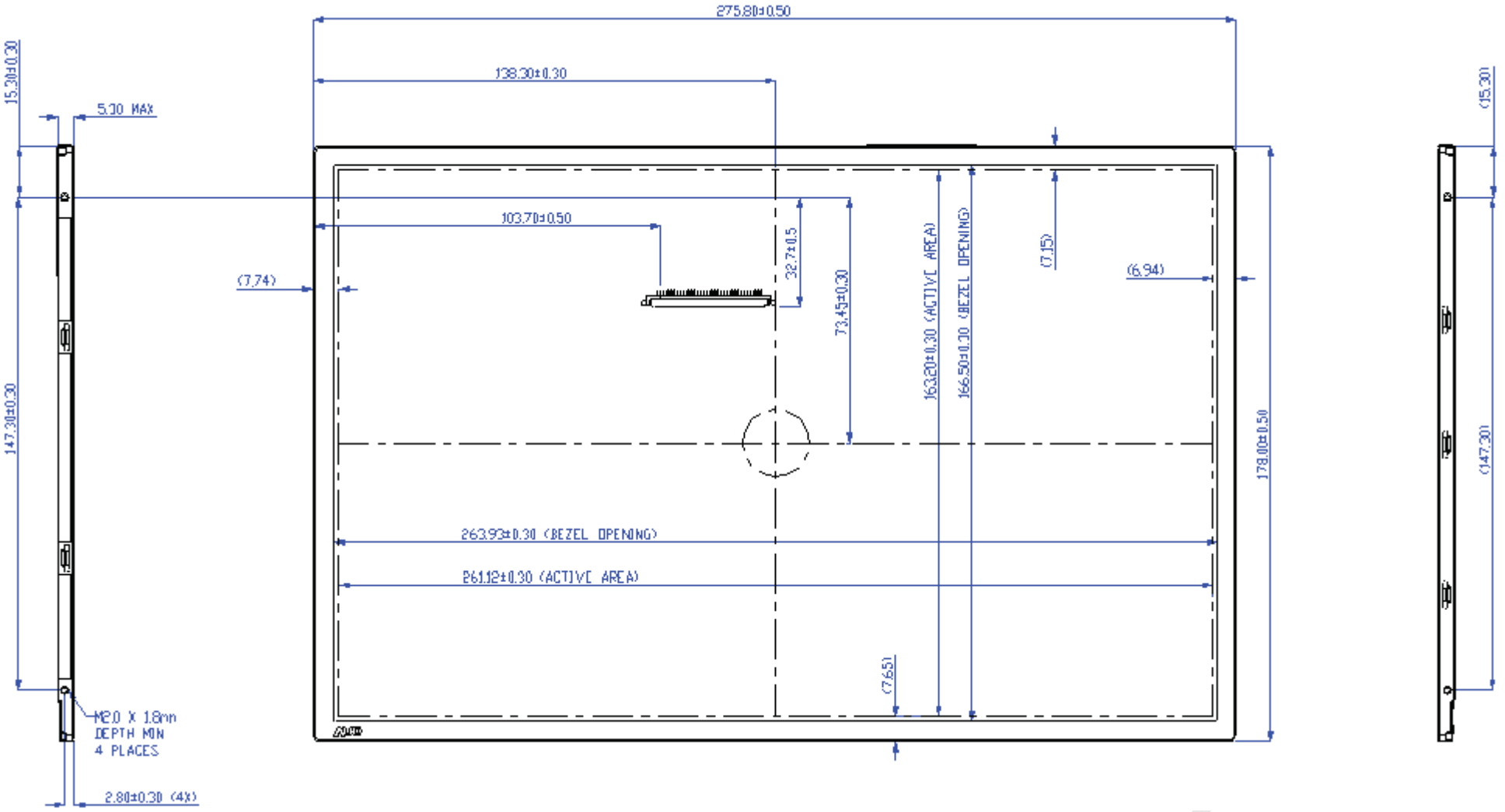
Items	Required Condition	Note
Temperature Humidity Bias	Ta= 40℃, 90%RH, 300h	
High Temperature Operation	Ta= 50℃, Dry, 300h	
Low Temperature Operation	Ta= 0℃, 300h	
High Temperature Storage	Ta= 60℃, 300h	
Low Temperature Storage	Ta= -20℃, 300h	
Thermal Shock Test	Ta=-20℃to 60℃, Duration at 30 min, 100 cycles	
ESD	Contact : ±8 KV Air : ±15 KV	Note 1

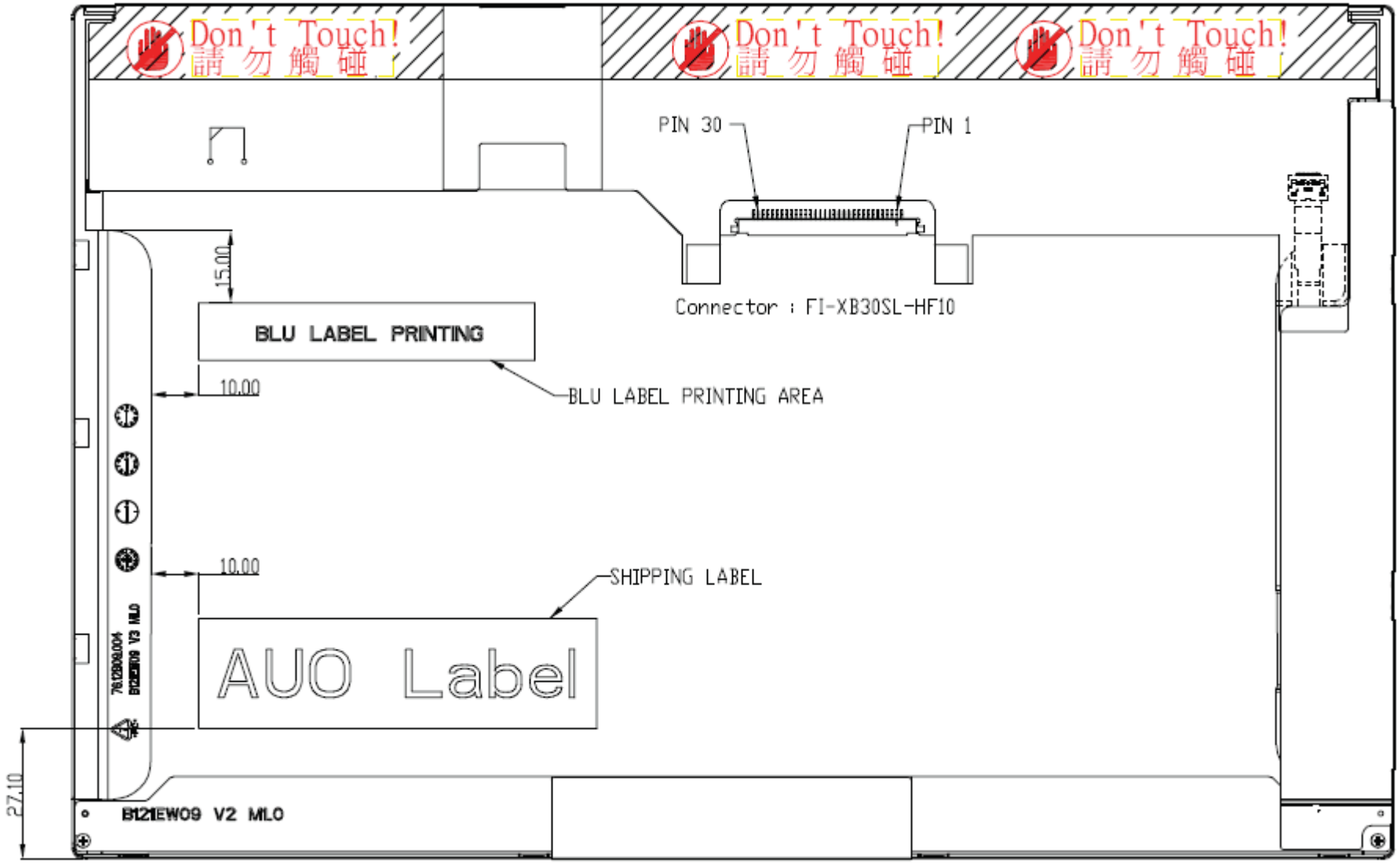
Note1: According to EN 61000-4-2 , ESD class B: Some performance degradation allowed. No data lost . Self-recoverable. No hardware failures.

Remark: MTBF (Excluding the LED): 30,000 hours with a confidence level 90%

11. Mechanical Characteristics

11.1 LCM Outline Dimension





11.2 Screw Hole Depth and Center Position

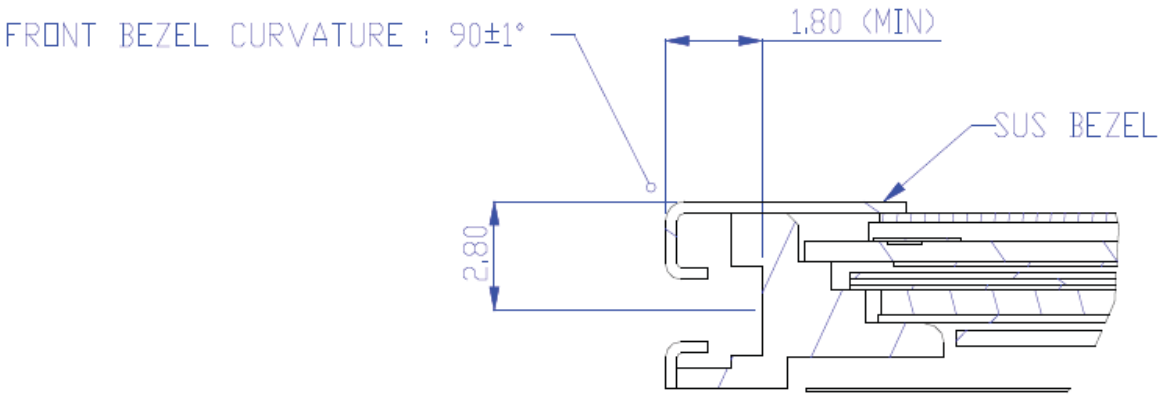
Screw hole minimum depth, from side surface = 1.8 mm (See drawing)

Screw hole center location, from front surface = 2.8mm (See drawing)

Screw Torque:

2.3 ~ 2.5 kgf-cm Max (Rework 6 times)

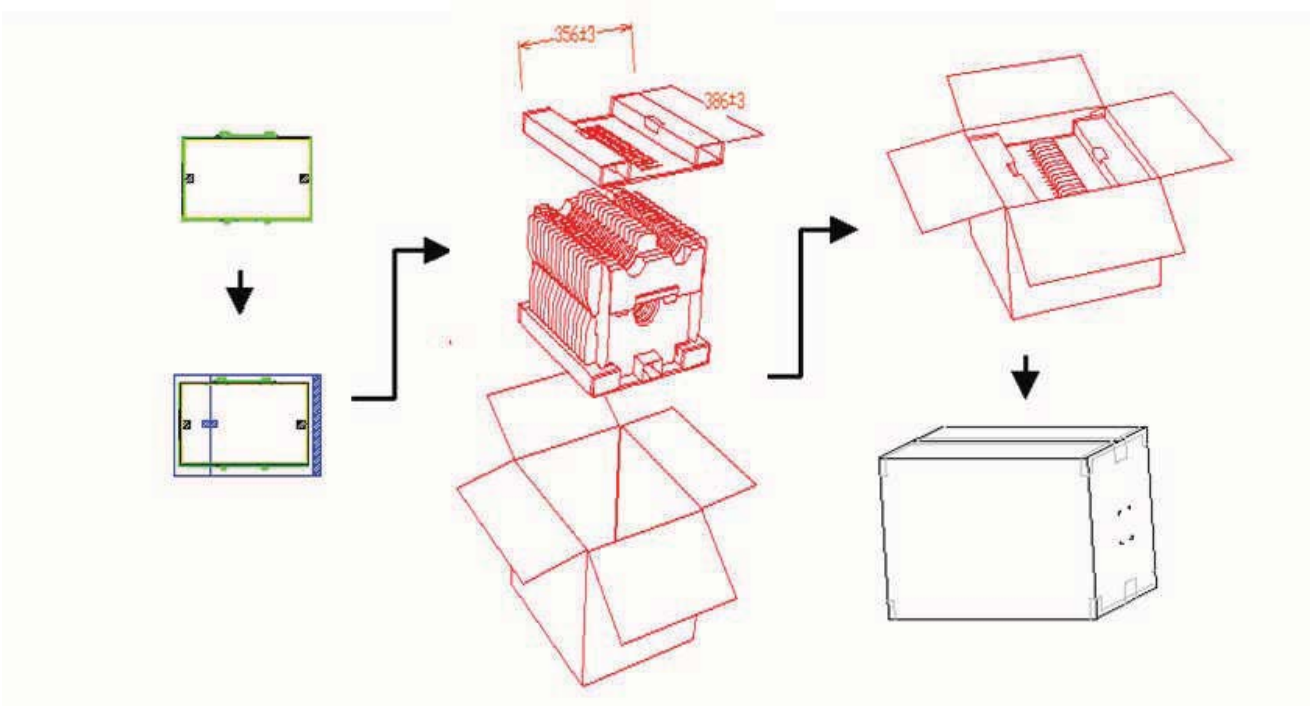
3.0 kgf-cm max Max (Rework 3 times)



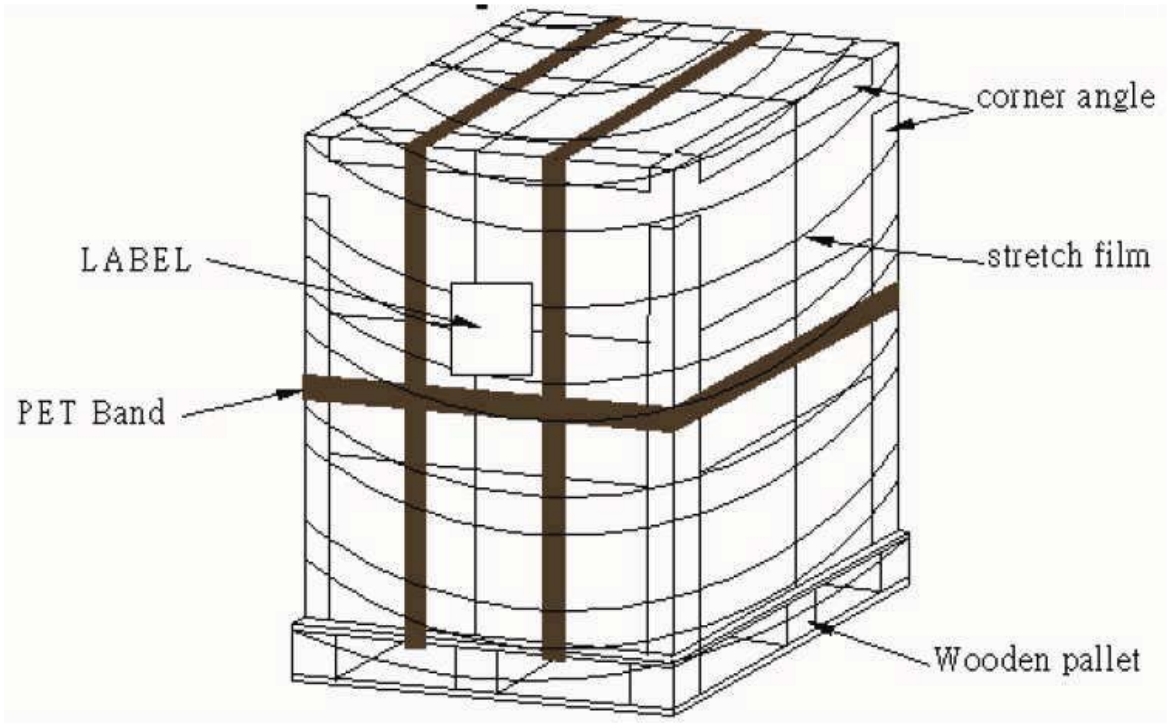
12. Shipping and Package

12.1 Shipping Label Format

12.2 Carton package



12.3 Shipping package of palletizing sequence



13. Appendix: EDID description

Byte# (decimal)	Byte# (HEX)	Field Name and Comments	Value (HEX)	Remarks	Value (Hex)	Value (Decimal)	Value (Binary)
0	00	Header	00	EDID VESA Spec Fixed	00	0	00000000
1	01	Header	FF	EDID VESA Spec Fixed	FF	255	11111111
2	02	Header	FF	EDID VESA Spec Fixed	FF	255	11111111
3	03	Header	FF	EDID VESA Spec Fixed	FF	255	11111111
4	04	Header	FF	EDID VESA Spec Fixed	FF	255	11111111
5	05	Header	FF	EDID VESA Spec Fixed	FF	255	11111111
6	06	Header	FF	EDID VESA Spec Fixed	FF	255	11111111
7	07	Header	00	EDID VESA Spec Fixed	00	0	00000000
8	08	ID Manufacturer Name	30	LEN	30	48	00110000
9	09		AE		AE	174	10101110
10	0A	ID Product Code	11	12" 16:10 WXGA 1280x800 LED B/L	11	17	00010001
11	0B		40		40	64	01000000
12	0C	ID Serial Number (32-bit serial number)	00	not used	00	0	00000000
13	0D		00	not used	00	0	00000000
14	0E		00	not used	00	0	00000000
15	0F		00	not used	00	0	00000000
16	10	Week of Manufacture			01	1	00000001
17	11	Year of Manufacture			13	19	00010011
18	12	EDID Structure version	01	Ver. 1.3	01	1	00000001
19	13	EDID Revision	03		03	3	00000011
20	14	Video Input Definition	80	Digital	80	128	10000000
21	15	Max H Image Size(cm)			1A	26	00011010
22	16	Max V Image Size(cm)			10	16	00010000
23	17	Display gamma (gamma x 100)-100	78	2.2	78	120	01111000
24	18	Feature support(DPMS)	EA	Lenovo Spec fixed	EA	234	11101010
25	19	Red/Green Low Bits			65	101	01100101
26	1A	Blue/White Low Bits			85	133	10000101
27	1B	Red x			8F	143	10001111
28	1C	Red y			59	89	01011001
29	1D	Green x			58	88	01011000
30	1E	Green y			8F	143	10001111
31	1F	Blue x			26	38	00100110
32	20	Blue y			1B	27	00011011
33	21	White x			50	80	01010000
34	22	White y			54	84	01010100
35	23	Established Timing 1	00	Lenovo Spec fixed	00	0	00000000
36	24	Established Timing 2	00	Lenovo Spec fixed	00	0	00000000

37	25	Manufacturer's Timings	00		00	0	00000000
38	26	Standard Timing Identification #1	01	Lenovo Spec fixed	01	1	00000001
39	27		01	Lenovo Spec fixed	01	1	00000001
40	28	Standard Timing Identification #2	01	Lenovo Spec fixed	01	1	00000001
41	29		01	Lenovo Spec fixed	01	1	00000001
42	2A	Standard Timing Identification #3			01	1	00000001
43	2B				01	1	00000001
44	2C	Standard Timing Identification #4			01	1	00000001
45	2D				01	1	00000001
46	2E	Standard Timing Identification #5			01	1	00000001
47	2F				01	1	00000001
48	30	Standard Timing Identification #6			01	1	00000001
49	31				01	1	00000001
50	32	Standard Timing Identification #7			01	1	00000001
51	33				01	1	00000001
52	34	Standard Timing Identification #8			01	1	00000001
53	35				01	1	00000001
54	36	Pixel Clock/10,000 (LSB)		Refresh rate 60Hz	12	18	00010010
55	37	Pixel Clock/10,000 (MSB) /			1B	27	00011011
56	38	Horizontal Active			00	0	00000000
57	39	Horizontal Blanking			7B	123	01111011
58	3A	Horizontal Active : Horizontal Blanking			50	80	01010000
59	3B	Vertical Active			20	32	00100000
60	3C	Vertical Blanking			15	21	00010101
61	3D	Vertical Active : Vertical Blanking			30	48	00110000
62	3E	Horizontal Sync. Offset			30	48	00110000
63	3F	Horizontal Sync Pulse Width			20	32	00100000
64	40	Vertical Sync Offset : Sync Width			36	54	00110110
65	41	Horizontal Vertical Sync Offset/Width upper 2bits			00	0	00000000
66	42	Horizontal Image Size			05	5	00000101
67	43	Vertical Image Size			A3	163	10100011
68	44	Horizontal & Vertical Image Size			10	16	00010000
69	45	Horizontal Border			00	0	00000000
70	46	Vertical Border			00	0	00000000
71	47	Flags			18	24	00011000
72	48	Pixel Clock/10,000 (LSB) (Slow Refresh rate)		Refresh rate 50Hz	7F	127	01111111
73	49	Pixel Clock/10,000 (MSB) / (Slow Refresh rate)			16	22	00010110

74	4A	Horizontal Active			00	0	00000000
75	4B	Horizontal Blanking			7B	123	01111011
76	4C	Horizontal Active : Horizontal Blanking			50	80	01010000
77	4D	Vertical Active			20	32	00100000
78	4E	Vertical Blanking			15	21	00010101
79	4F	Vertical Active : Vertical Blanking			30	48	00110000
80	50	Horizontal Sync. Offset			30	48	00110000
81	51	Horizontal Sync Pulse Width			20	32	00100000
82	52	Vertical Sync Offset : Sync Width			36	54	00110110
83	53	Horizontal Vertical Sync Offset/Width upper 2bits = 0			00	0	00000000
84	54	Horizontal Image Size			05	5	00000101
85	55	Vertical Image Size			A3	163	10100011
86	56	Horizontal & Vertical Image Size			10	16	00010000
87	57	Horizontal Border			00	0	00000000
88	58	Vertical Border			00	0	00000000
89	59	Flags			18	24	00011000
90	5A	Flag	00	VESA Spec Fixed	00	0	00000000
91	5B	Flag	00	VESA Spec Fixed	00	0	00000000
92	5C	Flag	00	VESA Spec Fixed	00	0	00000000
93	5D	Data Type Tag	0F	Lenovo Spec fixed	0F	15	00001111
94	5E	Flag	00	VESA Spec Fixed	00	0	00000000
95	5F	(Horizontal active pixel /8)-31	81	129	81	129	10000001
96	60	Image Aspect Ratio	0A	16 : 10	0A	10	00001010
97	61	Middle Refresh Rate	3C	60	3C	60	00111100
98	62	(Horizontal active pixel /8)-31	81	129	81	129	10000001
99	63	Image Aspect Ratio	0A	16 : 10	0A	10	00001010
100	64	Low Refresh Rate	32	50	32	50	00110010
101	65	Brightness(1/10nit)			16	22	00010110
102	66	Feature flag	09	TN LED B/L	09	9	00001001
103	67	Reserved	00	Lenovo Spec fixed	00	0	00000000
104	68	LCD Supplier manufacture Code (3 character ID)			06	6	00000110
105	69				AF	175	10101111
106	6A	LCD Supplier Product code			56	86	01010110
107	6B	LCD Supplier Product code			33	51	00110011
108	6C	Flag	00	VESA Spec Fixed	00	0	00000000
109	6D	Flag	00	VESA Spec Fixed	00	0	00000000
110	6E	Flag	00	VESA Spec Fixed	00	0	00000000
111	6F	Data Type Tag	FE	Lenovo Spec fixed	FE	254	11111110
112	70	Flag	00	VESA Spec Fixed	00	0	00000000
113	71	Model Name			42	66	01000010

114	72	Model Name			31	49	00110001
115	73	Model Name			32	50	00110010
116	74	Model Name			31	49	00110001
117	75	Model Name			45	69	01000101
118	76	Model Name			57	87	01010111
119	77	Model Name			30	48	00110000
120	78	Model Name			39	57	00111001
121	79	Model Name			20	32	00100000
122	7A	Model Name			56	86	01010110
123	7B	Model Name			33	51	00110011
124	7C	Model Name			20	32	00100000
125	7D	Model Name			0A	10	00001010
126	7E	Extension flag	00	VESA Spec Fixed	00	0	00000000
127	7F	Checksum			9B	155	10011011

Product Specification

AU OPTRONICS CORPORATION

( ) Preliminary Specifications
(V) Final Specifications

Module	**" WXGA Color TFT-LCD with LED Backlight design**
Model Name	**B121EW09 V3 (H/W:0A)**
Note ( )	***LED Backlight with driving circuit design***

Customer	Date	Approved by	Date
		Beyond Yang	08/19/2009
Checked & Approved by	**Date**	**Prepared by**	
		DonnaYang	08/19/2009

Note: This Specification is subject to change without notice.

NBBU Marketing Division / AU Optronics corporation

Product Specification

AU OPTRONICS CORPORATION

Contents

Record of Revision

Version and Date	Page	Old description	New Description	Remark
0.1 2008/12/30	6,7	White Luminance 220 typ	White Luminance 200 typ	
0.2 2009/1/7	6,7	White Luminance 200 typ White Luminance 170 min	White Luminance 220 typ White Luminance 187 min	
0.3 2009/1/20	36	EDID:TBD	EDID, Check Sum 1E	
0.4 2009/4/1	6,7	White Luminance 220 typ White Luminance 187 min	White Luminance 260 typ White Luminance 220 min	
1.1 2009/4/30	20	PWM for luminance control (200~1KHz, 3.3V, 10~100%)	PWM for luminance control (200~20KHz, 3.3V, 10~100%)	
1.2 2009/4/30	30	Shippint label (normal)	Shippint label (add CT label information)	
1.3 2009/5/18	16	Output PWM frequency - Duty Ratio 10% min	Output PWM frequency 100 min Duty Ratio 10% min 5%	
1.3 2009/8/19	31		Update Screw Hole Depth	

1. Handling Precautions

1) Since front polarizer is easily damaged, pay attention not to scratch it.
2) Be sure to turn off power supply when inserting or disconnecting from input connector.
3) Wipe off water drop immediately. Long contact with water may cause discoloration or spots.
4) When the panel surface is soiled, wipe it with absorbent cotton or other soft cloth.
5) Since the panel is made of glass, it may break or crack if dropped or bumped on hard surface.
6) Since CMOS LSI is used in this module, take care of static electricity and insure human earth when handling.
7) Do not open nor modify the Module Assembly.
8) Do not press the reflector sheet at the back of the module to any directions.
9) At the insertion or removal of the Signal Interface Connector, be sure not to rotate nor tilt the Interface Connector of the TFT Module.
11) After installation of the TFT Module into an enclosure (Notebook PC Bezel, for example), do not twist nor bend the TFT Module even momentary. At designing the enclosure, it should be taken into consideration that no bending/twisting forces are applied to the TFT Module from outside. Otherwise the TFT Module may be damaged.
12) Small amount of materials having no flammability grade is used in the LCD module. The LCD module should be supplied by power complied with requirements of Limited Power Source (IEC60950 or UL1950), or be applied exemption.
13) Disconnecting power supply before handling LCD modules, it can prevent electric shock, DO NOT TOUCH the electrode parts, cables, connectors and LED circuit part of TFT module that a LED light bar build in as a light source of back light unit. It can prevent electrostic breakdown.

2. General Description

B121EW09 V3 is a Color Active Matrix Liquid Crystal Display composed of a TFT LCD panel, a driver circuit, and LED backlight system. The screen format is intended to support the WXGA (1280(H) x 800(V)) screen and 262k colors (RGB 6-bits data driver) with LED backlight driving circuit. All input signals are LVDS interface compatible.

B121EW09 V3 is designed for a display unit of notebook style personal computer and industrial machine.

2.1 General Specification

The following items are characteristics summary on the table at 25 ℃ condition:

Items	Unit	Specifications
Screen Diagonal	[mm]	307.9 (W")
Active Area	[mm]	261.12(H) X 163.20(V)
Pixels H x V		1280x3(RGB) x 800
Pixel Pitch	[mm]	0.204X0.204
Pixel Arrangement		R.G.B. Vertical Stripe
Display Mode		Normally White
White Luminance (I_{LED}=20mA)	[cd/m^2]	260 typ. (5 points average) 220 min. (5 points average)
Luminance Uniformity		1.25 max. (5 points)
Contrast Ratio		500 typ
Response Time	[ms]	16 typ / 25 Max
Nominal Input Voltage VDD	[Volt]	+3.3 typ.
Power Consumption	[Watt]	4.3 max. (Include Logic and Black Light power)
Weight	[Grams]	270 max.
Physical Size	[mm]	<table><tr><td></td><td>L</td><td>W</td><td>T</td></tr><tr><td>Max</td><td>276.3</td><td>178.6</td><td>5.5</td></tr><tr><td>Typical</td><td>275.8</td><td>178.1</td><td>-</td></tr><tr><td>Min</td><td>275.3</td><td>-</td><td>-</td></tr></table>
Electrical Interface		1 channel LVDS
Surface Treatment		AG

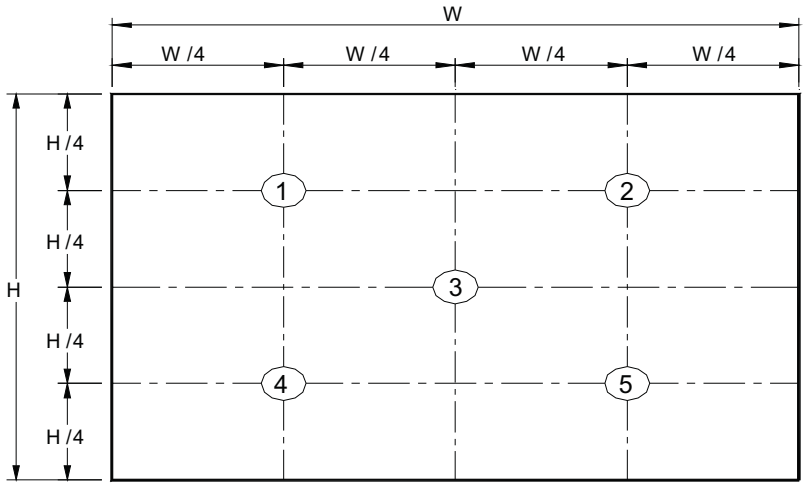
Support Color		262K colors (RGB 6-bit)
Temperature Range Operating Storage (Non-Operating)	 [°C] [°C]	 0 to +50 -20 to +65
RoHS Compliance		RoHS Compliance

2.2 Optical Characteristics

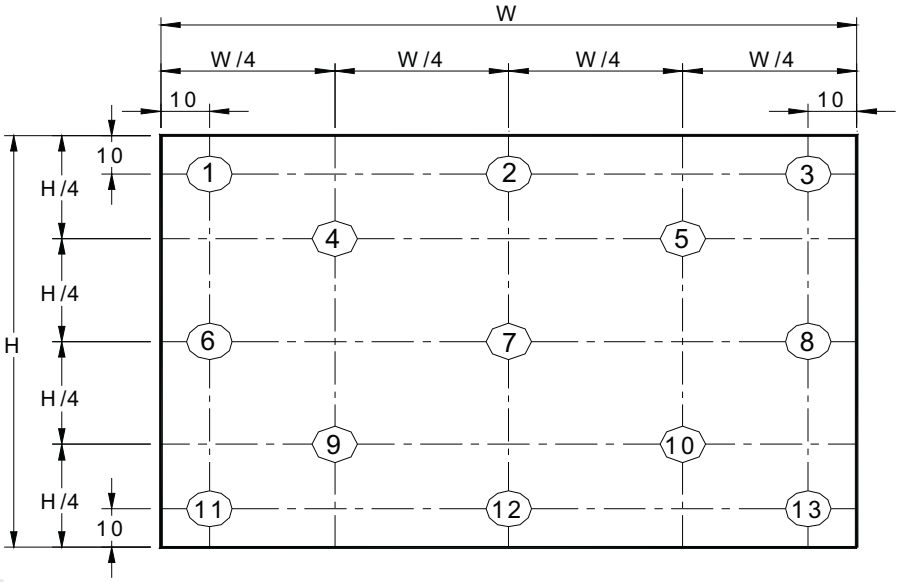
The optical characteristics are measured under stable conditions at 25℃ (Room Temperature) :

Item		Symbol	Conditions	Min.	Typ.	Max.	Unit	Note
White Luminance I_{LED}=20mA			5 points average	220	260	-	cd/m^2	1, 4, 5.
Viewing Angle		θ_R	Horizontal (Right) CR = 10	40	45	-	degree	4, 9
		θ_L	(Left)	40	45	-		
		ϕ_H	Vertical (Upper) CR = 10	10	15	-		
		ϕ_L	(Lower)	30	35	-		
Luminance Uniformity		δ_{5P}	5 Points	-	-	1.25		1, 3, 4
Luminance Uniformity		δ_{13P}	13 Points	-	-	1.50		2, 3, 4
Contrast Ratio		CR			500	-		4, 6
Cross talk		%				4		4, 7
Response Time		T_r	Rising	-	_	-	msec	4, 8
		T_f	Falling	-	_	-		
		T_{RT}	Rising + Falling	-	16	25		
Color / Chromaticity Coodinates	Red	Rx	CIE 1931	0.530	0.560	0.590		4
		Ry		0.320	0.350	0.380		
	Green	Gx		0.315	0.345	0.375		
		Gy		0.530	0.560	0.590		
	Blue	Bx		0.120	0.150	0.180		
		By		0.075	0.105	0.135		
	White	Wx		0.283	0.313	0.343		
		Wy		0.299	0.329	0.359		
NTSC		%		-	45	-		

Note 1: 5 points position (Ref: Active area)



Note 2: 13 points position (Ref: Active area)



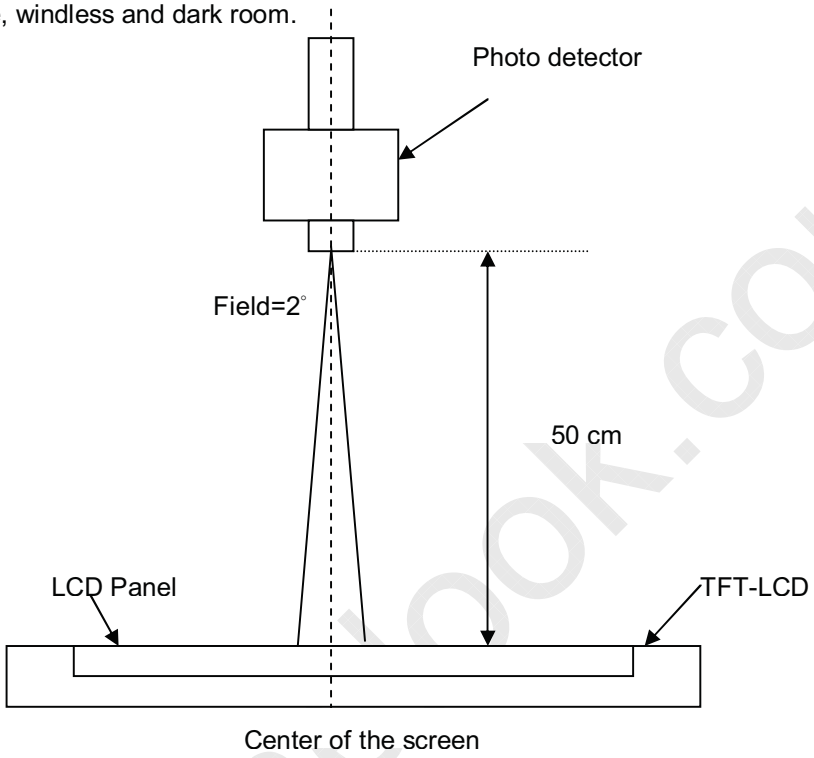
Note 3: The luminance uniformity of 5 or13 points is defined by dividing the maximum luminance values by the minimum test point luminance

$$\delta_{W5} = \frac{\text{Maximum Brightness of five points}}{\text{Minimum Brightness of five points}}$$

$$\delta_{W13} = \frac{\text{Maximum Brightness of thirteen points}}{\text{Minimum Brightness of thirteen points}}$$

Note 4: Measurement method

The LCD module should be stabilized at given temperature for 30 minutes to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting Backlight for 30 minutes in a stable, windless and dark room.



Note 5： Definition of Average Luminance of White (Y_L):

Measure the luminance of gray level 63 at 5 points，Y_L = [L (1)+ L (2)+ L (3)+ L (4)+ L (5)] / 5

L (x) is corresponding to the luminance of the point X at Figure in Note (1).

Note 6： Definition of contrast ratio:

Contrast ratio is calculated with the following formula.

$$\text{Contrast ratio (CR)} = \frac{\text{Brightness on the “White” state}}{\text{Brightness on the “Black” state}}$$

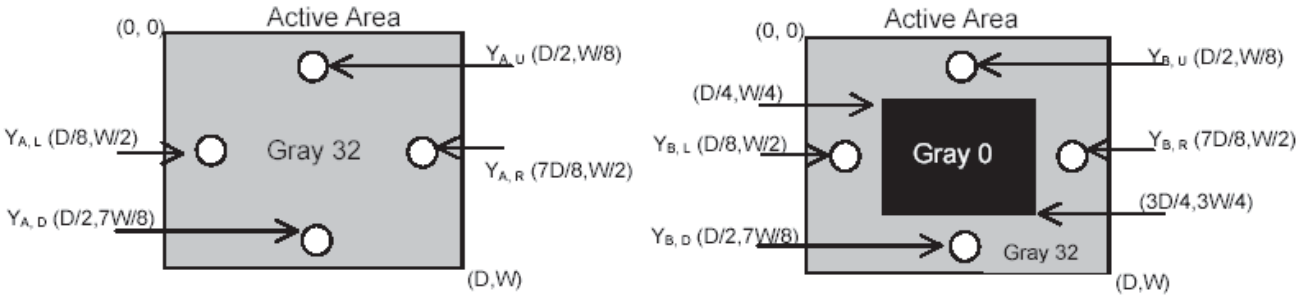
Note 7： Definition of Cross Talk (CT)

$CT = | Y_B – Y_A | / Y_A \times 100\ (\%)$

Where

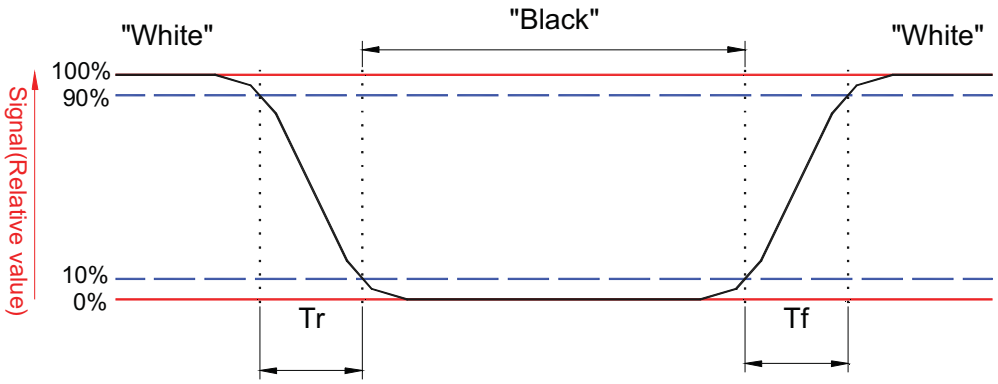
Y_A = Luminance of measured location without gray level 0 pattern (cd/m^2)

Y_B = Luminance of measured location with gray level 0 pattern (cd/m2)



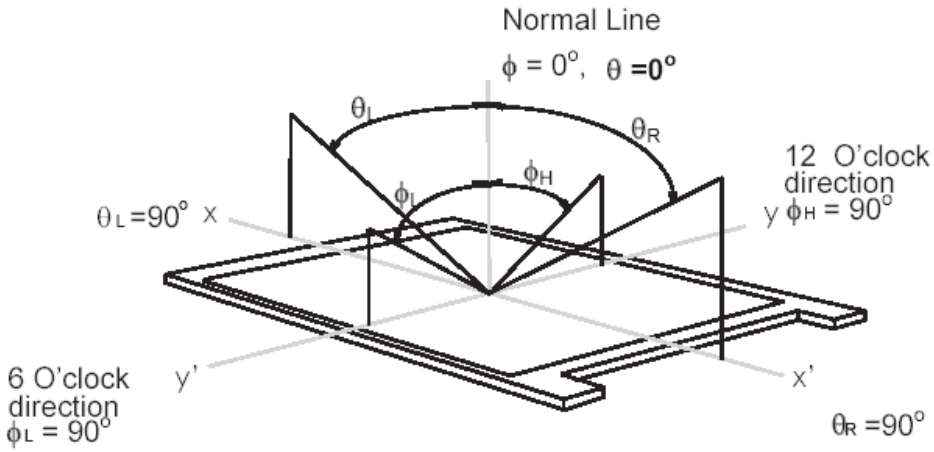
Note 8: Definition of response time:

The output signals of BM-7 or equivalent are measured when the input signals are changed from “Black” to “White” (falling time) and from “White” to “Black” (rising time), respectively. The response time interval between the 10% and 90% of amplitudes. Refer to figure as below.



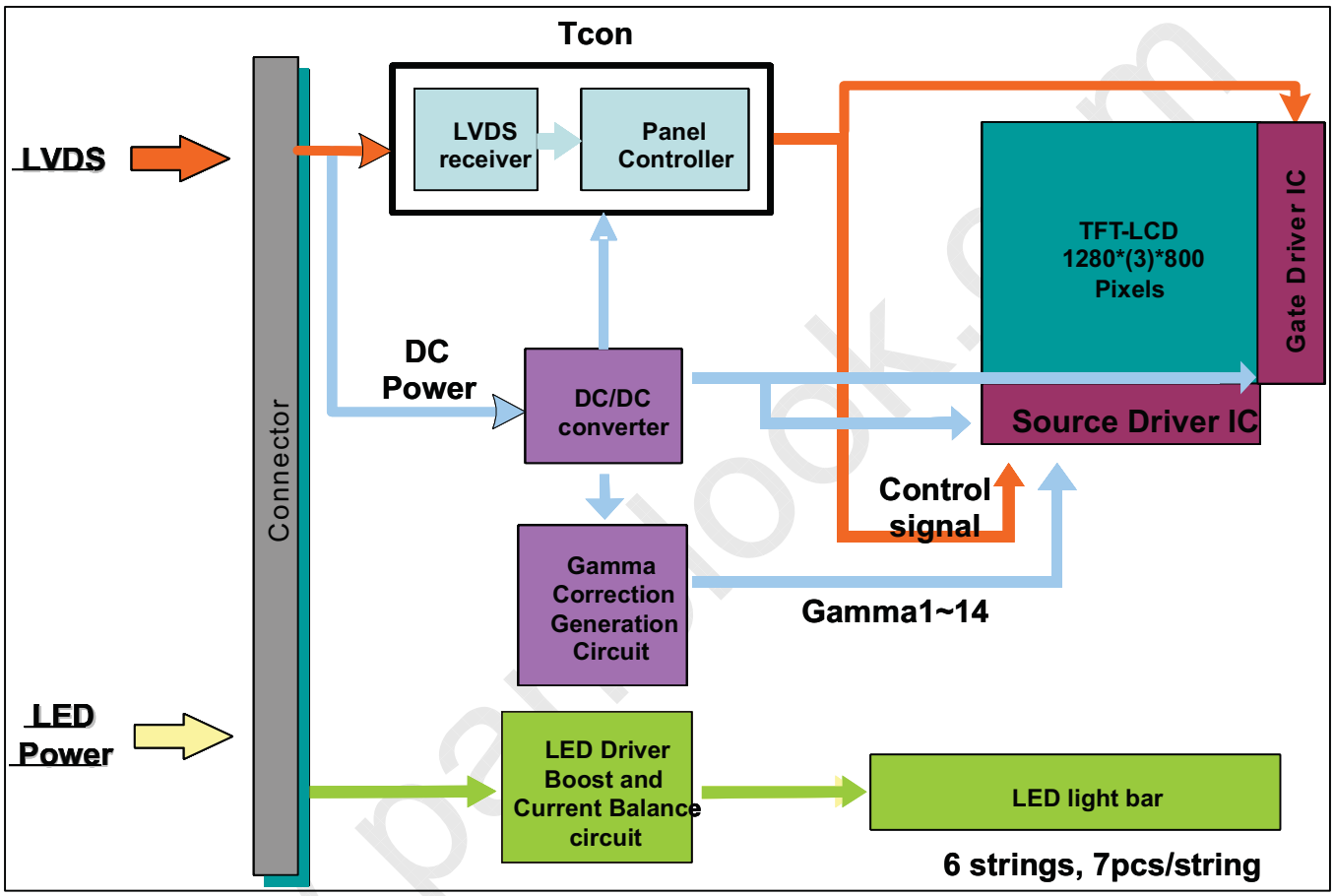
Note 8. Definition of viewing angle

Viewing angle is the measurement of contrast ratio ≧10, at the screen center, over a 180° horizontal an d 180° vertical range (off-normal viewing angles). The 180° viewing angle range is broken down as follows; 90 °(θ) horizontal left and right and 90°(Φ) vertical, high (up) and low (down). The measurement direction is typically perpendicular to the display surface with the screen rotated about its center to develop the desired measurement viewing angle.



3. Functional Block Diagram

The following diagram shows the functional block of the 12.1 inches wide Color TFT/LCD 40 Pin (One ch/connector Module:



4. Absolute Maximum Ratings

An absolute maximum rating of the module is as following:

4.1 Absolute Ratings of TFT LCD Module

Item	Symbol	Min	Max	Unit	Conditions
Logic/LCD Drive	Vin	-0.3	+4.0	[Volt]	Note 1,2

4.2 Absolute Ratings of Backlight Unit

Item	Symbol	Min	Max	Unit	Conditions
LED Driving Voltage	V_{LED}	-	36 (Row Output)	[Volt]	Note 1,2,3
LED Driving Current	I_{LED}	-	30 (Row Output)	[mA] rms	Note 1,2,3

4.3 Absolute Ratings of Environment

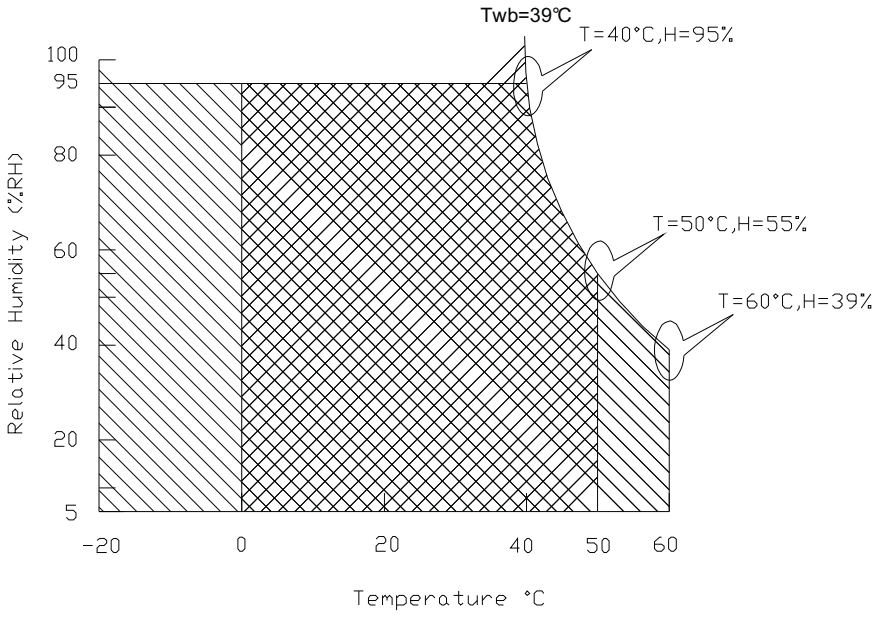
Item	Symbol	Min	Max	Unit	Conditions
Operating Temperature	TOP	0	+50	[°C]	Note 4
Operation Humidity	HOP	10	90	[%RH]	Note 4
Storage Temperature	TST	-20	+65	[°C]	Note 4
Storage Humidity	HST	10	90	[%RH]	Note 4

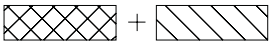
Note 1: At Ta (25℃)

Note 2: Permanent damage to the device may occur if exceed maximum values

Note 3: LED specification refer to section 5.2

Note 4: For quality performance, please refer to AUO IIS (Incoming Inspection Standard).



Operating Range  Storage Range 

5. Electrical characteristics

5.1 TFT LCD Module

5.1.1 Power Specification

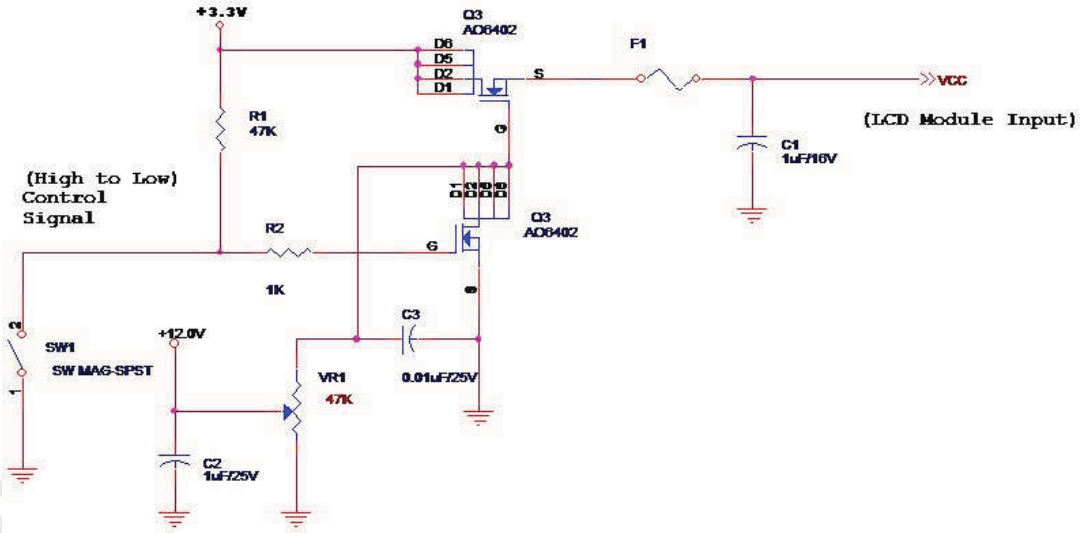
Input power specifications are as follows;

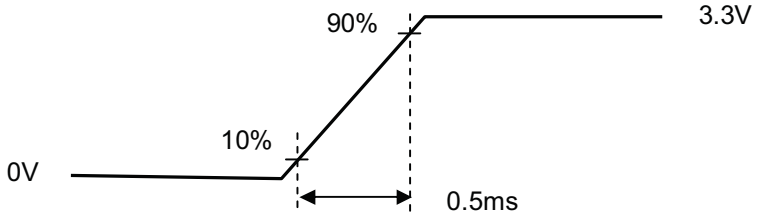
Symble	Parameter	Min	Typ	Max	Units	Note
VDD	Logic/LCD Drive Voltage	3.0	3.3	3.6	[Volt]	
PDD	VDD Power	-		0.9	[Watt]	Note 1/2
IDD	IDD Current	-	-	250	[mA]	Note 1/2
IRush	Inrush Current	-	-	2000	[mA]	Note 3
VDDrp	Allowable Logic/LCD Drive Ripple Voltage	-	-	100	[mV] p-p	

Note 1 : Maximum Measurement Condition：Black Pattern

Note 2：Typical Measurement Condition: Mosaic Pattern

Note 3：Measure Condition





Vin rising time

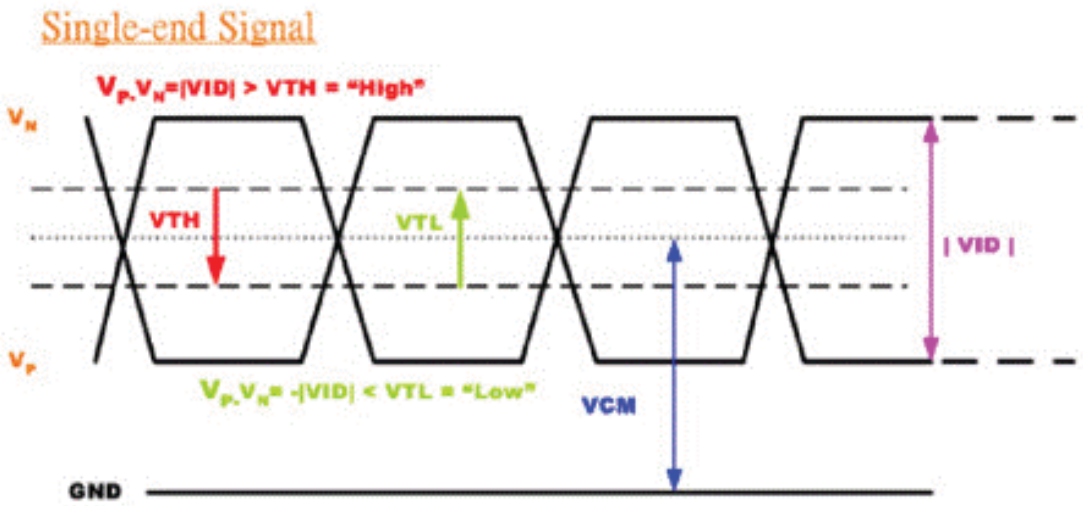
5.1.2 Signal Electrical Characteristics

Input signals shall be low or High-impedance state when VDD is off.

Signal electrical characteristics are as follows;

Parameter	Condition	Min	Max	Unit
V_{TH}	Differential Input High Threshold (Vcm=+1.2V)		100	[mV]
V_{TL}	Differential Input Low Threshold (Vcm=+1.2V)	-100	-	[mV]
$\|V_{ID}\|$	Differential Input Voltage	100	600	[mV]
V_{CM}	Differential Input Common Mode Voltage	1.125	1.375	[V]

Note: LVDS Signal Waveform



5.2 Backlight Unit

LED Parameter guideline for LED driving selection (Ref. Remark 1)

Parameter	Symbol	Min	Typ	Max	Units	Condition
LED Forward Voltage	V_F	2.95	3.15	3.35	[Volt]	(Ta=25℃)
LED Forward Current	I_F		20	30	[mA]	(Ta=25℃)
LED Power consumption	P_{LED}		3.78		[Watt]	(Ta=25℃) Note 1
LED Life-Time	N/A	12,000	-	-	Hour	(Ta=25℃) I_F=20 mA Note 2
Output PWM frequency	FPWM	-	200	20K	Hz	
Duty ratio	--	5	--	100	%	

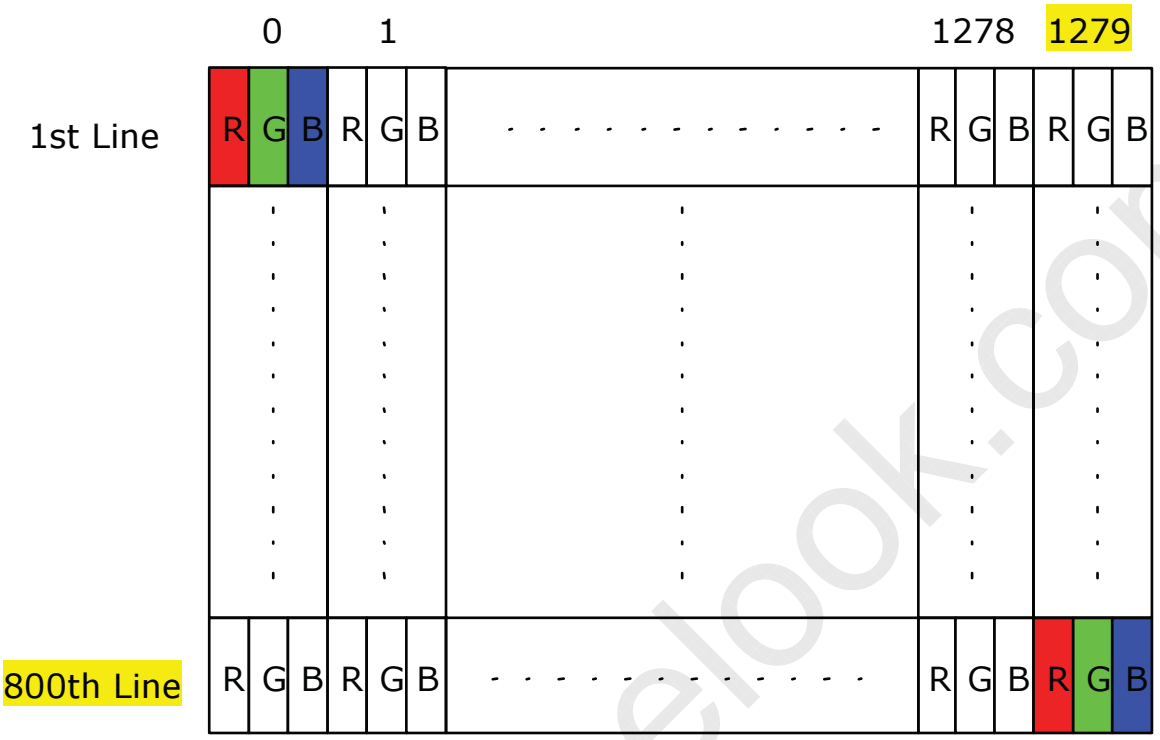
Note 1: Calculator value for reference $I_F \times V_F \times$ 42/ efficiency(85%)=P(typ.)

Note 2: The LED life-time define as the estimated time to 50% degradation of initial luminous.

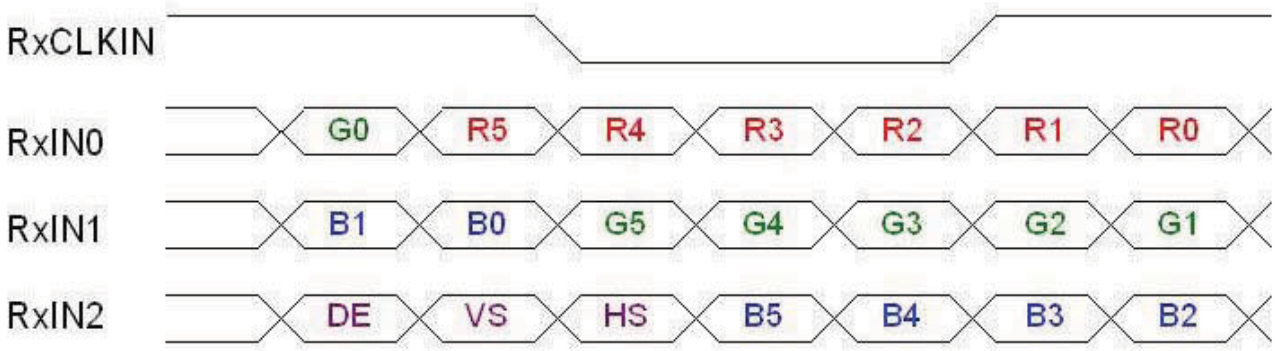
6. Signal Characteristic

6.1 Pixel Format Image

Following figure shows the relationship of the input signals and LCD pixel format.



6.2 The input data format



Signal Name	Description	
R5 R4 R3 R2 R1 R0	Red Data 5 (MSB) Red Data 4 Red Data 3 Red Data 2 Red Data 1 Red Data 0 (LSB) Red-pixel Data	Red-pixel Data Each red pixel's brightness data consists of these 6 bits pixel data.
G5 G4 G3 G2 G1 G0	Green Data 5 (MSB) Green Data 4 Green Data 3 Green Data 2 Green Data 1 Green Data 0 (LSB) Green-pixel Data	Green-pixel Data Each green pixel's brightness data consists of these 6 bits pixel data.
B5 B4 B3 B2 B1 B0	Blue Data 5 (MSB) Blue Data 4 Blue Data 3 Blue Data 2 Blue Data 1 Blue Data 0 (LSB) Blue-pixel Data	Blue-pixel Data Each blue pixel's brightness data consists of these 6 bits pixel data.
RxCLKIN	Data Clock	The typical frequency is 69.3 MHZ. The signal is used to strobe the pixel data and DE signals. All pixel data shall be valid at the falling edge when the DE signal is high.
DE	Display Timing	This signal is strobed at the falling edge of RxCLKIN. When the signal is high, the pixel data shall be valid to be displayed.
VS	Vertical Sync	The signal is synchronized to RxCLKIN .
HS	Horizontal Sync	The signal is synchronized to RxCLKIN .

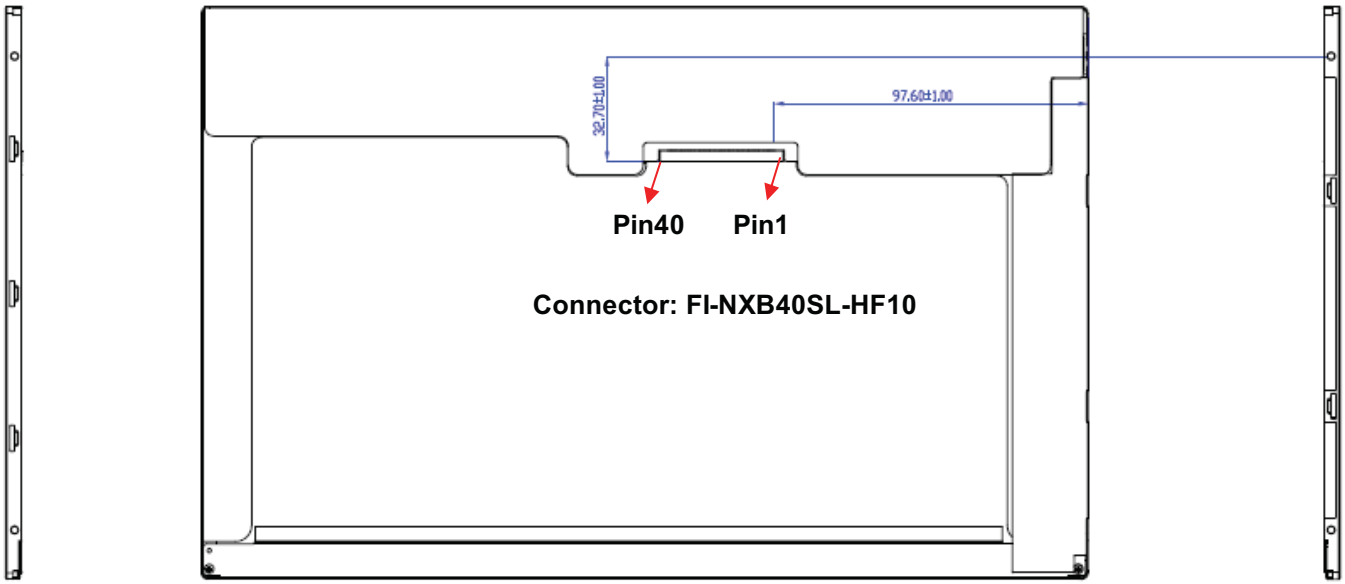
Note: Output signals from any system shall be low or High-impedance state when VDD is off.

6.3 Signal Description/Pin Assignment

LVDS is a differential signal technology for LCD interface and high speed data transfer device.

Pin	Signal	Description
1	NC	No Connection (Reserved for supplier)
2	VDD	Power Supply, 3.3V (typical)
3	VDD	Power Supply, 3.3V (typical)
4	VEDID	EDID 3.3V power
5	NC	No Connection
6	CLKEDID	EDID Clock Input
7	DATAEDID	EDID Data Input
8	RxIN0-	- LVDS differential data input (R0-R5, G0)
9	RxIN0+	+ LVDS differential data input (R0-R5, G0)
10	GND	Ground
11	RxIN1-	- LVDS differential data input (G1-G5, B0-B1)
12	RxIN1+	+ LVDS differential data input (G1-G5, B0-B1)
13	GND	Ground
14	RxIN2-	- LVDS differential data input (B2-B5,HS,VS, DE)
15	RxIN2+	+ LVDS differential data input (B2-B5,HS,VS, DE)
16	GND	Ground
17	RxCLKIN-	- LVDS differential clock input
18	RxCLKIN+	+ LVDS differential clock input
19	GND	Ground
20	NC	No Connection
21	NC	No Connection
22	GND	Ground
23	NC	No Connection
24	NC	No Connection
25	GND	Ground
26	NC	No Connection
27	NC	No Connection
28	GND	Ground
29	NC	No Connection
30	NC	No Connection
31	VBL-	LED Ground
32	VBL-	LED Ground
33	VBL-	LED Ground
34	NC	No Connection (Reserved for supplier)
35	VBL+	LED Power Supply 6V-20V
36	VBL+	LED Power Supply 6V-20V
37	VBL+	LED Power Supply 6V-20V
38	BLIM	PWM for luminance control (200~20KHz, 3.3V, 10~100%)
39	BL_Enable	BL On/Off (On: 2.0~3.3V, Off: 0~0.5V)
40	NC	No Connect (Reserve for AUO test)

Note1: Start from right side



6.4 Interface Timing

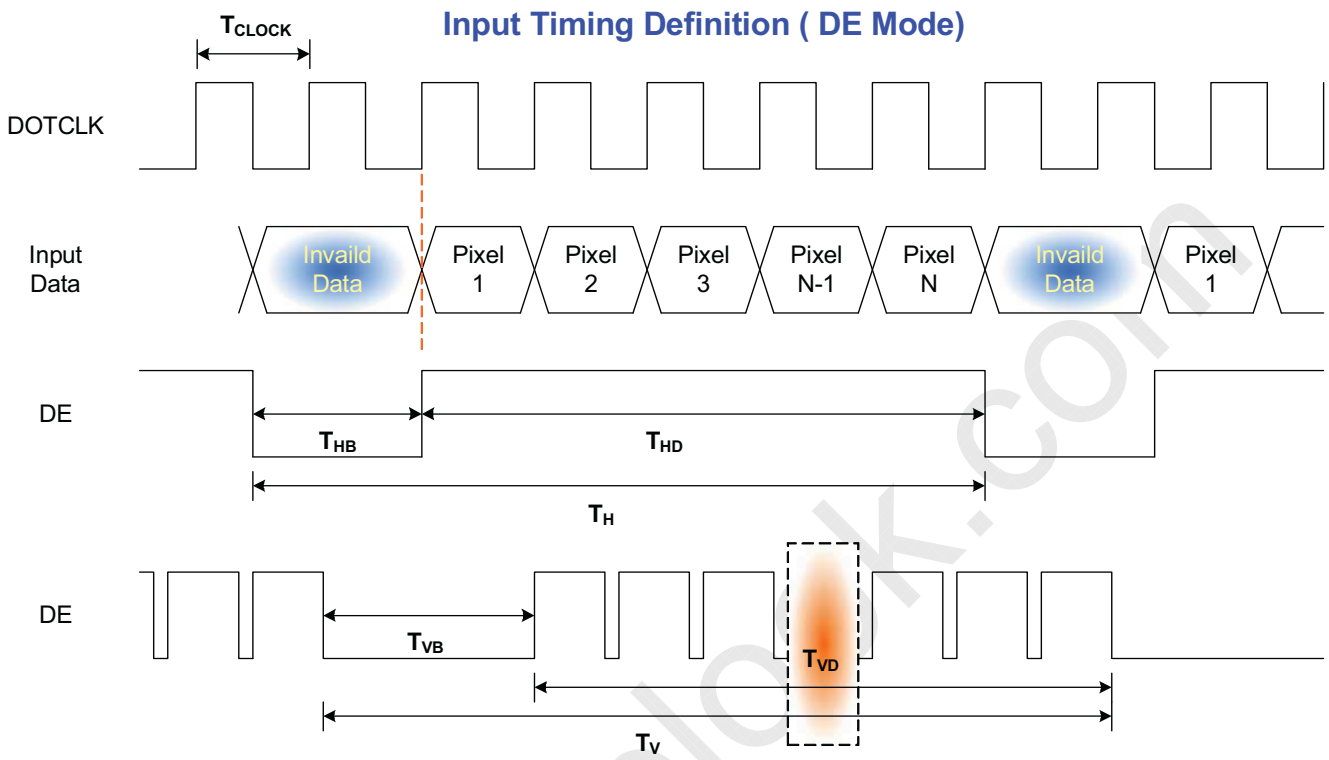
6.4.1 Timing Characteristics

Basically, interface timings should match the 1280x800 /60Hz manufacturing guide line timing.

Parameter		Symbol	Min.	Typ.	Max.	Unit
Frame Rate		-	-	60	-	Hz
Clock frequency		$1/T_{Clock}$	50-	69.3	80-	MHz
Vertical Section	Period	T_V	803	816	1023	T_{Line}
	Active	T_{VD}	800	800	800	
	Blanking	T_{VB}	3	16	223	
Horizontal Section	Period	T_H	1303	1416	2047	T_{Clock}
	Active	T_{HD}	1280	1280	1280	
	Blanking	T_{HB}	23	136	767	

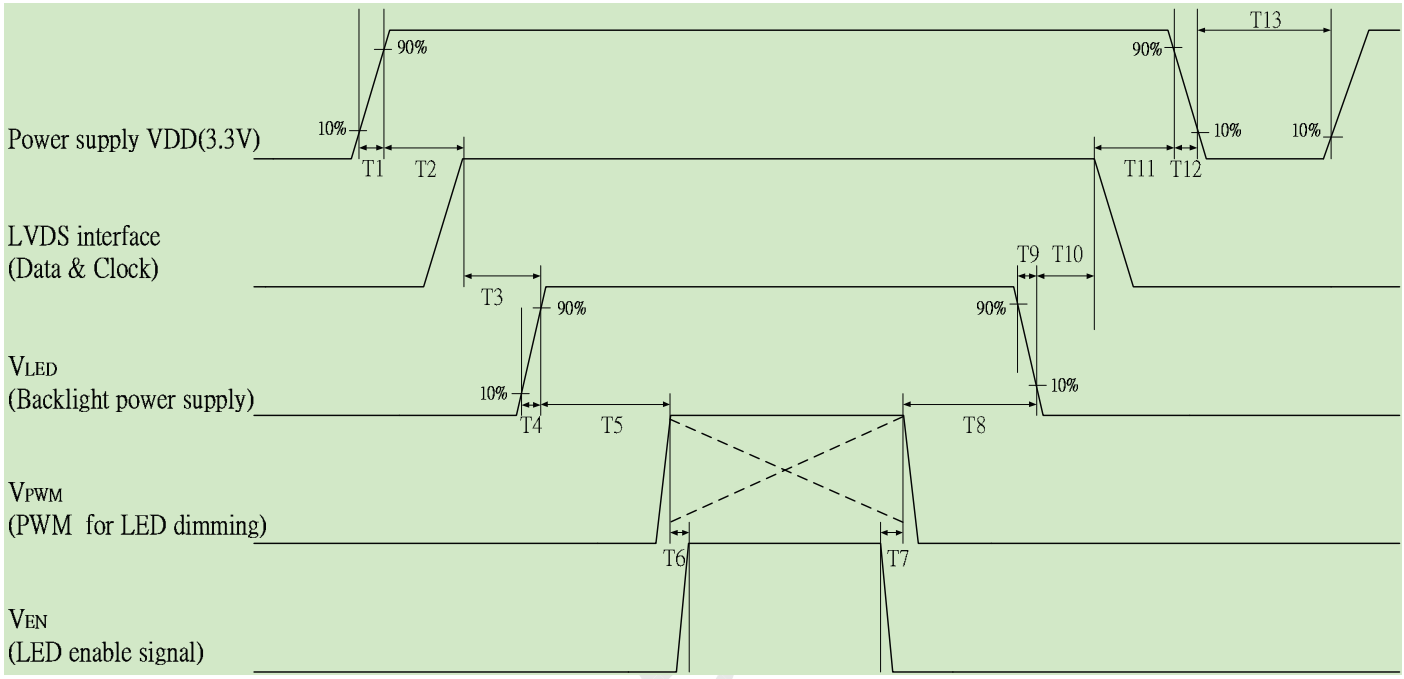
Note : DE mode only

6.4.2 Timing diagram



6.5 Power ON /OFF Sequence

Power on/off sequence is as follows. Interface signals and LED on/off sequence are also shown in the chart. Signals from any system shall be Hi-Z state or low level when VDD is off



Power Sequence Timing				
Parameter	Value			Units
	Min.	Typ.	Max.	
T1	0.5	-	10	ms
T2	0	-	50	
T3	200	-	-	
T4	0.5	-	10	
T5	10	-	-	
T6	10	-	-	
T7	0	-	-	
T8	10	-	-	
T9	0	-	10	
T10	200	-	-	
T11	0.5	-	50	
T12	0	-	10	
T13	400	-	-	

Note:If T3,T5,T6 couldn't match above specifications, must request T3+T5+T6 > 200ms at least

7. Connector Description

Physical interface is described as for the connector on module.

These connectors are capable of accommodating the following signals and will be following components.

7.1 TFT LCD Module

Connector Name / Designation	For Signal Connector
Manufacturer	Japan Aviation Electronics Industry, LTD
Type / Part Number	FI-NXB40SL-HF10 or compatible
Mating Housing/Part Number	FI-NX40CL or compatible

8. 8. LED Driving Specification

8.1 Connector Description

It is a intergrative interface and comibe into LVDS connector. The type and mating refer to section 7.

8.2 Pin Assignment

Ref. to 6.3

9. Vibration and Shock Test

9.1 Vibration Test

Test Spec:

- Test method: Non-Operation
- Acceleration: 1.5 G
- Frequency: 10 - 500Hz Random
- Sweep: 30 Minutes each Axis (X, Y, Z)

9.2 Shock Test Spec:

Test Spec:

- Test method: Non-Operation
- Acceleration: 220 G , Half sine wave
- Active time: 2 ms
- Pulse: X,Y,Z .one time for each side

10. Reliability

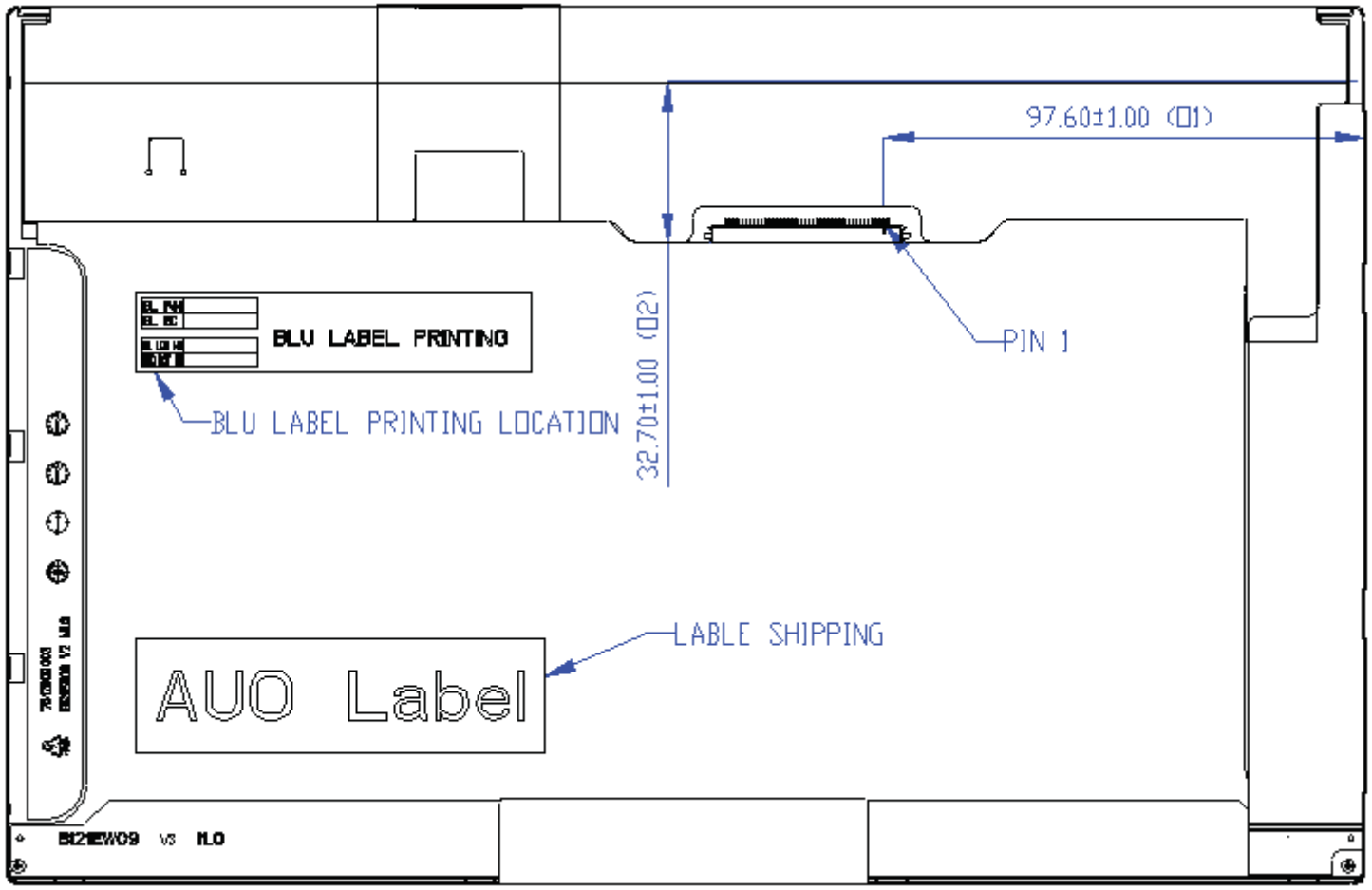
Items	Required Condition	Note
Temperature Humidity Bias	Ta= 40℃, 90%RH, 300h	
High Temperature Operation	Ta= 50℃, Dry, 300h	
Low Temperature Operation	Ta= 0℃, 300h	
High Temperature Storage	Ta= 60℃, 300h	
Low Temperature Storage	Ta= -20℃, 300h	
Thermal Shock Test	Ta=-20℃to 60℃, Duration at 30 min, 100 cycles	
ESD	Contact : ±8 KV Air : ±15 KV	Note 1

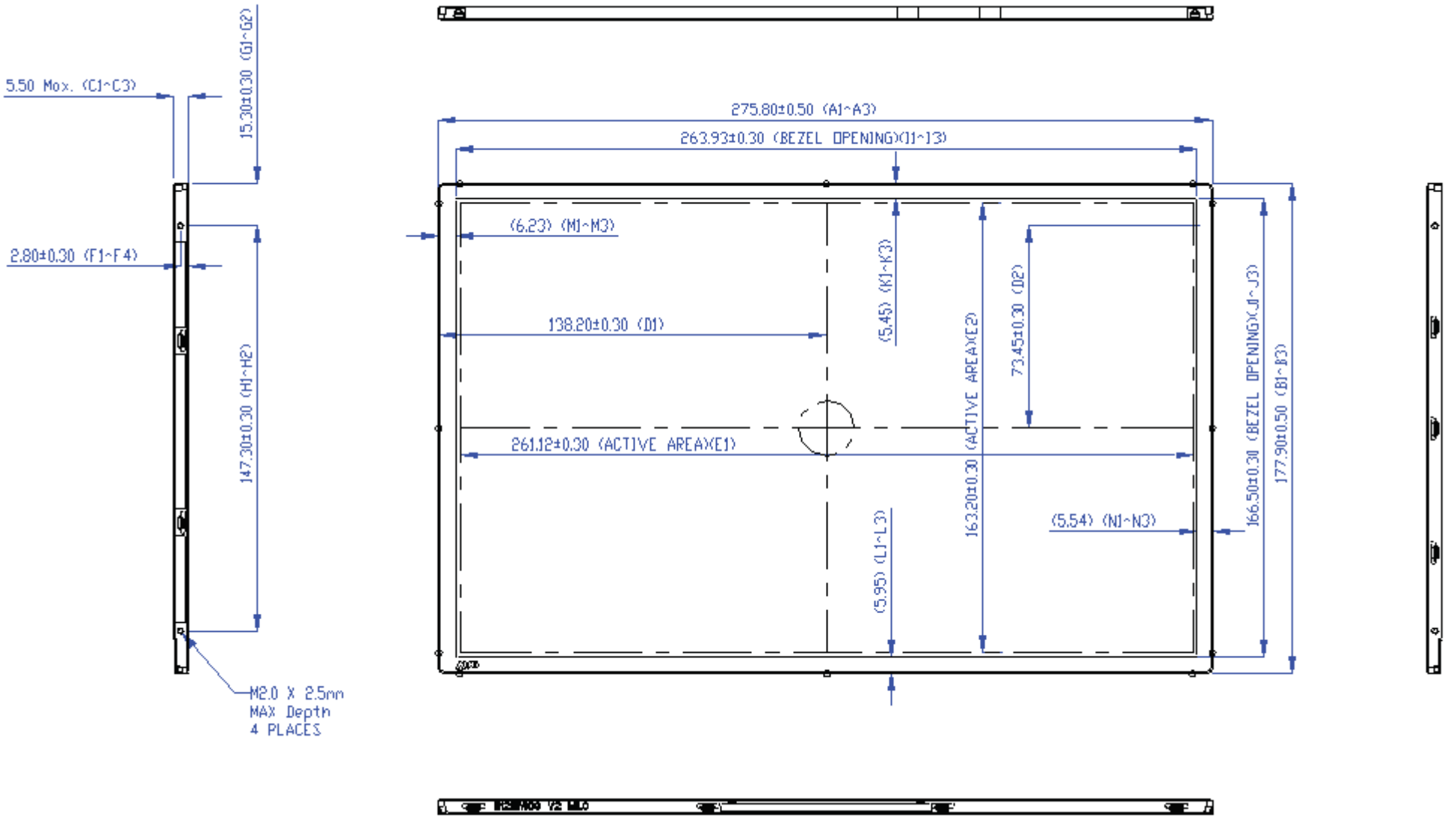
Note1: According to EN 61000-4-2 , ESD class B: Some performance degradation allowed. No data lost . Self-recoverable. No hardware failures.

Remark: MTBF (Excluding the LED): 30,000 hours with a confidence level 90%

11. Mechanical Characteristics

11.1 LCM Outline Dimension

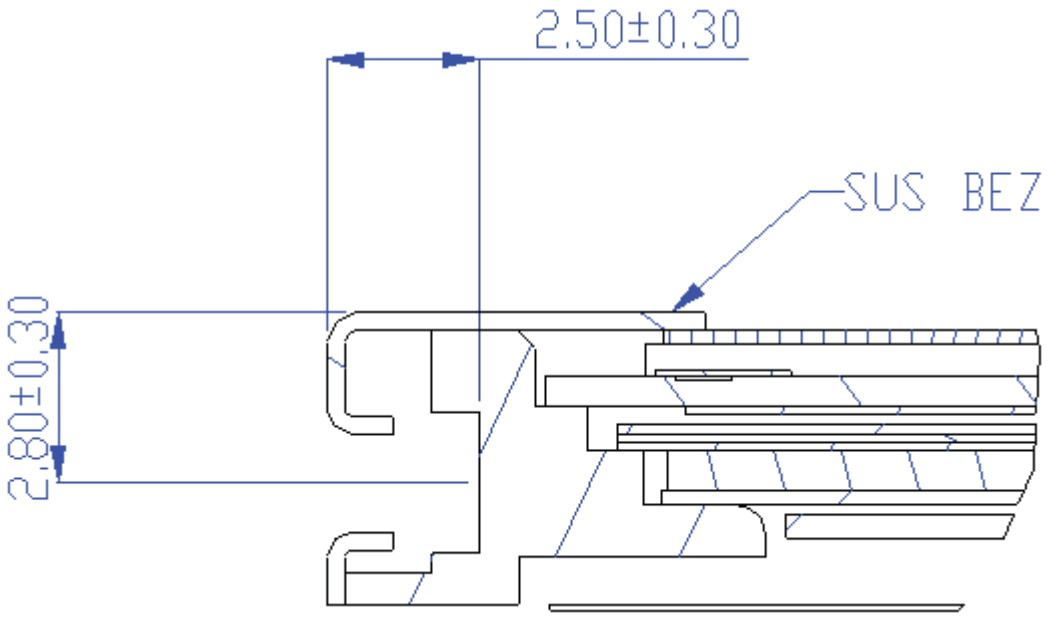




11.2 Screw Hole Depth and Center Position

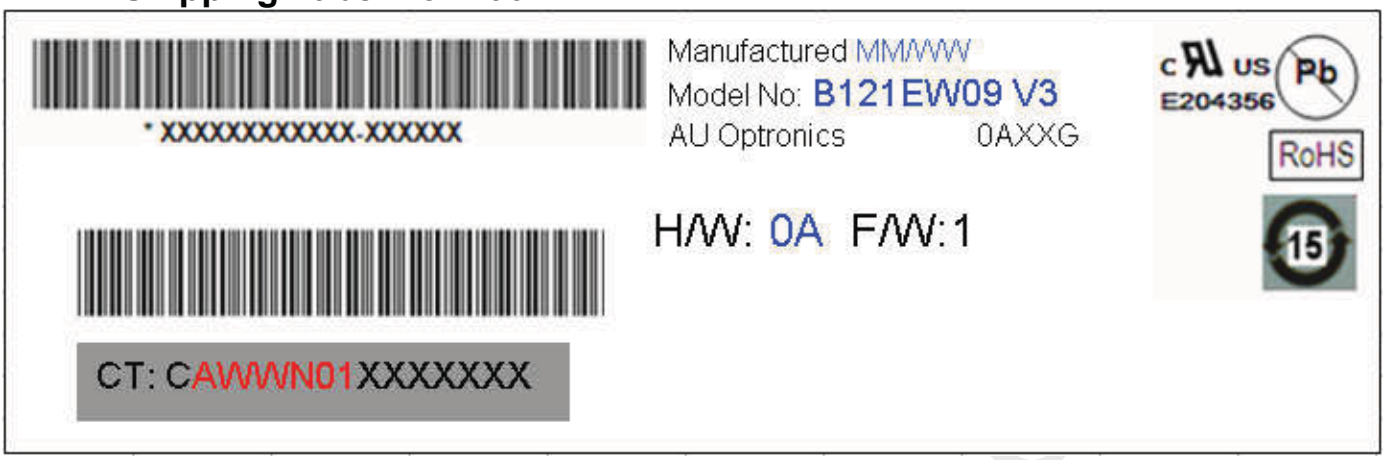
Screw hole minimum depth, from side surface = 2.2 mm (See drawing)

Screw hole center location, from front surface = 2.8 ± 0.3mm (See drawing)
Screw Torque: Maximum 2.5 kgf-cm

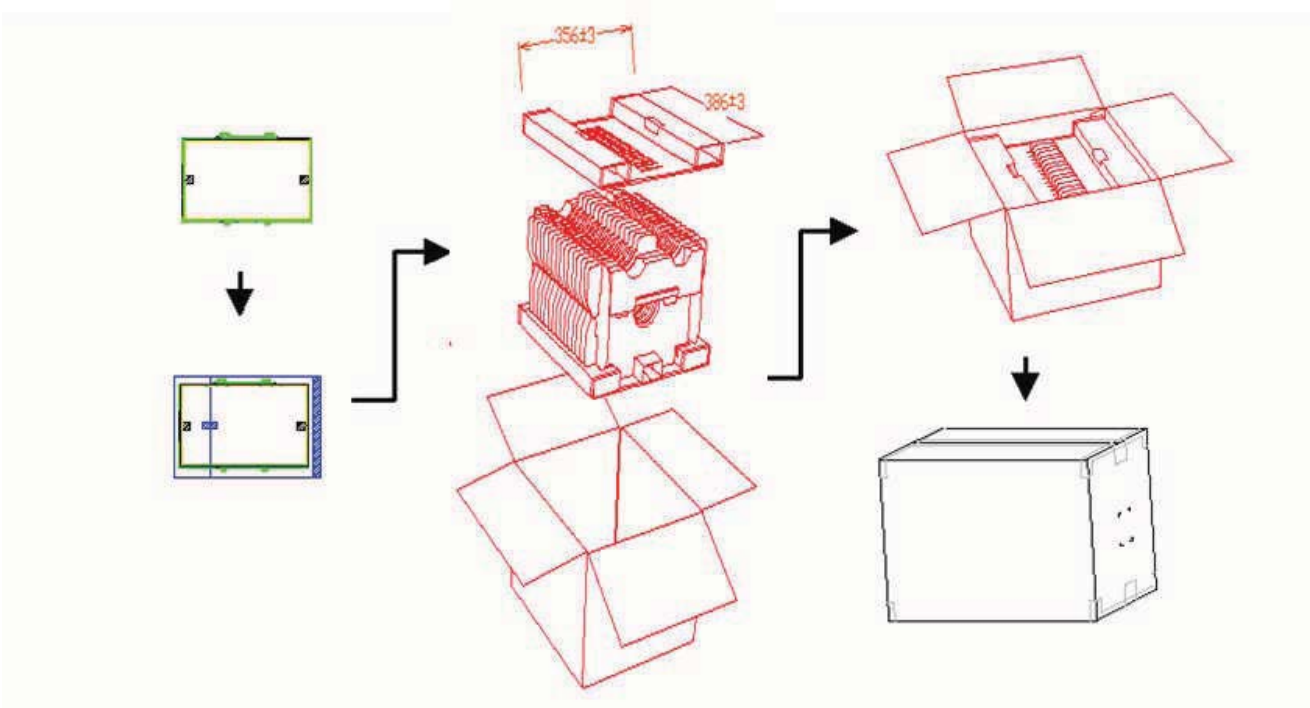


12. Shipping and Package

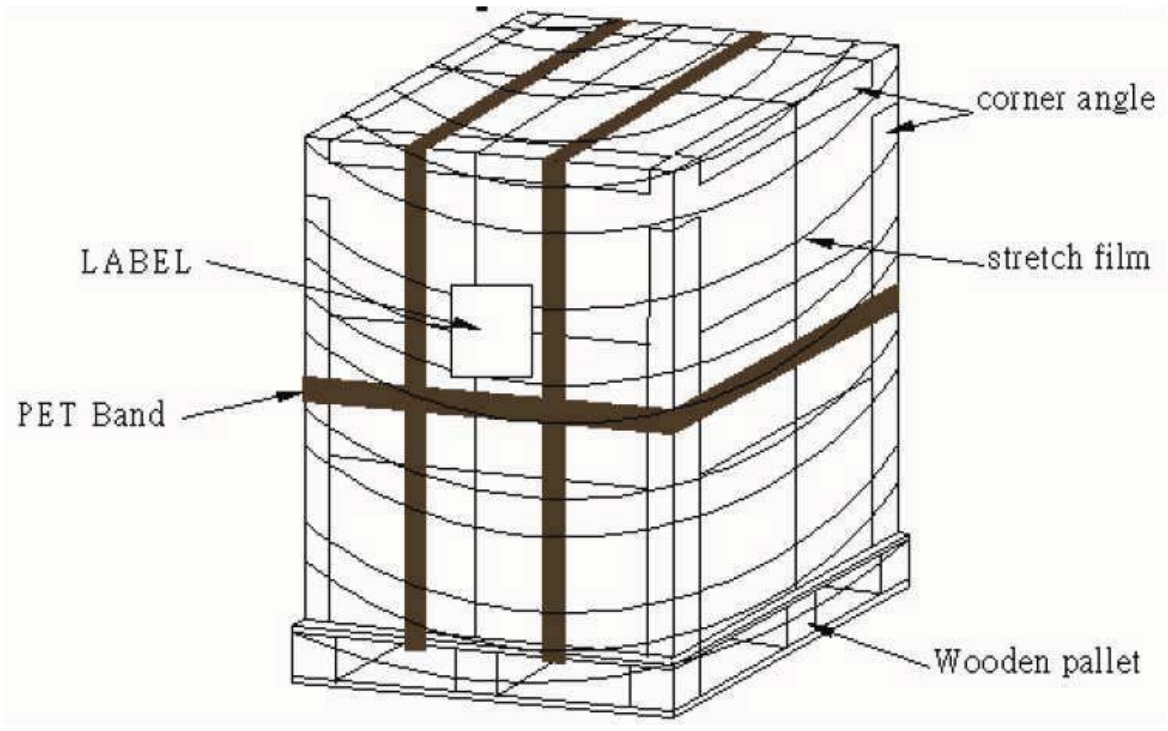
12.1 Shipping Label Format



12.2 Carton package



12.3 Shipping package of palletizing sequence



13. Appendix: EDID description

Address HEX	FUNCTION	Value HEX	Value BIN	Value DEC
00	Header	00	00000000	0
01		FF	11111111	255
02		FF	11111111	255
03		FF	11111111	255
04		FF	11111111	255
05		FF	11111111	255
06		FF	11111111	255
07		00	00000000	0
08	EISA Manuf. Code LSB	06	00000110	6
09	Compressed ASCII	AF	10101111	175
0A	Product Code=44	14	00010100	20
0B	hex, LSB first=44	93	10010011	147
0C	32-bit ser #	00	00000000	0
0D		00	00000000	0
0E		00	00000000	0
0F		00	00000000	0
10	Week of manufacture	01	00000001	1
11	Year of manufacture	12	00010010	18
12	EDID Structure Ver#=1	01	00000001	1
13	EDID revision #=3	03	00000011	3
14	Video input def. (digital I/P, non-TMDS, CRGB)	80	10000000	128
15	Max H image size (rounded to cm)	1A	00011010	26
16	Max V image size (rounded to cm)	10	00010000	16
17	Display Gamma=2.2	78	01111000	120
18	Feature support (no DPMS, Active OFF, RGB, tmg Blk#1)	0A	00001010	10
19	Red/green low bits (Lower 2:2:2:2 bits)	65	01100101	101
1A	Blue/white low bits (Lower 2:2:2:2 bits)	85	10000101	133
1B	Red x=0.56	8F	10001111	143
1C	Red y=0.35	59	01011001	89
1D	Green x=0.345	58	01011000	88
1E	Green y=0.56	8F	10001111	143
1F	Blue x=0.15	26	00100110	38
20	Blue y=0.105	1B	00011011	27
21	White x=0.313	50	01010000	80
22	White y=0.329	54	01010100	84
23		00	00000000	0
24		00	00000000	0
25		00	00000000	0
26		01	00000001	1
27		01	00000001	1
28		01	00000001	1
29		01	00000001	1

2A		01	00000001	1
2B		01	00000001	1
2C		01	00000001	1
2D		01	00000001	1
2E		01	00000001	1
2F		01	00000001	1
30		01	00000001	1
31		01	00000001	1
32		01	00000001	1
33		01	00000001	1
34		01	00000001	1
35		01	00000001	1
36	Pixel Clock/10000 LSB	12	00010010	18
37	Pixel Clock/10000 USB	1B	00011011	27
38	Horz active Lower 8bits	00	00000000	0
39	Horz blanking Lower 8bits	7B	01111011	123
3A	HorzAct:HorzBlnk Upper 4:4 bits	50	01010000	80
3B	Vertical Active Lower 8bits	20	00100000	32
3C	Vertical Blanking Lower 8bits	15	00010101	21
3D	Vert Act : Vertical Blanking (upper 4:4 bit)	30	00110000	48
3E	HorzSync. Offset	30	00110000	48
3F	HorzSync.Width	20	00100000	32
40	VertSync.Offset	36	00110110	54
41	VertSync.Offset	00	00000000	0
42	Horizontal Image Size	05	00000101	5
43	Vertical Image Size	A3	10100011	163
44		10	00010000	16
45		00	00000000	0
46		00	00000000	0
47		18	00011000	24
48		00	00000000	0
49		00	00000000	0
4A		00	00000000	0
4B		0F	00001111	15
4C	Version	00	00000000	0
4D		00	00000000	0
4E		00	00000000	0
4F	Link Type(LVDS Link, MSB justified)	00	00000000	0
50	Pixel and link component format(6-bit panel interface)	00	00000000	0
51	Panel features (No inverter)	00	00000000	0
52		00	00000000	0
53		00	00000000	0
54		00	00000000	0
55		00	00000000	0
56		00	00000000	0
57		00	00000000	0

58		00	00000000	0
59		20	00100000	32
5A		00	00000000	0
5B		00	00000000	0
5C		00	00000000	0
5D		FE	11111110	254
5E		00	00000000	0
5F	A	41	01000001	65
60	U	55	01010101	85
61	O	4F	01001111	79
62		0A	00001010	10
63		20	00100000	32
64		20	00100000	32
65		20	00100000	32
66		20	00100000	32
67		20	00100000	32
68		20	00100000	32
69		20	00100000	32
6A		20	00100000	32
6B		20	00100000	32
6C	Detailed timing/monitor	00	00000000	0
6D	descriptor #4	00	00000000	0
6E		00	00000000	0
6F		FE	11111110	254
70		00	00000000	0
71	B	42	01000010	66
72	1	31	00110001	49
73	2	32	00110010	50
74	1	31	00110001	49
75	E	45	01000101	69
76	W	57	01010111	87
77	0	30	00110000	48
78	9	39	00111001	57
79		20	00100000	32
7A	V	56	01010110	86
7B	3	33	00110011	51
7C		20	00100000	32
7D		0A	00001010	10
7E	Extension Flag	00	00000000	0
7F	Checksum	1E	00011110	30